PROSPECTIVE STUDY ON TRAUMATIC HOLLOW VISCUS INJURIES

Dissertation submitted to

The Tamil Nadu Dr.M.G.R medical University

In partial fulfilment of the regulations

For the award of the degree of

M.S DEGREE BRANCH – I

GENERAL SURGERY

K.A.P.VISWANATHAM MEDICAL COLLEGE, TRICHY.

THE TAMILNADU Dr.M.G.R MEDICAL UNIVERSITY

CHENNAI, INDIA

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CERTIFICATE

This is to certify that the dissertation titled **"PROSPECTIVE STUDY ON TRAUMATIC HOLLOW VISCUS INJURIES"** is the original work done by **Dr.R.NANDHAKUMAR**, post graduate in the Department of General Surgery, K.A.P.Viswanatham Medical College, Trichy -620 001, to be submitted to the Tamil Nadu Dr.M.G.R Medical University, Chennai – 600 032, towards the partial fulfilment of the requirement for the award of M.S Degree in General Surgery, March2014.

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DECLARATION

I solemnly declare that the dissertation titled **"PROSPECTIVE STUDY ON TRAUMATIC HOLLOW VISCUS INJURIES"** is done by me at K.A.P.Viswanatham Medical College, Trichy -620 001, under the guidance and supervision of **Prof.DR.MK.MURALITHARAN M.S.,M.CH.,** The dissertation is submitted to The Tamil Nadu Dr.M.G.R Medical University, Chennai – 600 032, towards the partial fulfilment of the requirement for the award of M.S Degree in General Surgery.

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CERTIFICATE OF CLEARANCE

This is to certify that the project work titled **Prospective study on traumatic hollow viscus injuries in K.A.P.Viswanatham Government Medical College, Tiruchirapalli** proposed by **Dr.R.Nandha Kumar** part of fulfillment of M.D/M.S course in the subject of **Surgery** for the year **2011-2014** by The Tamilnadu Dr.MGR Medical University has been cleared by the ethical committee.

11/9/2013

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INTRODUCTION

Trauma is a major health problem in all countries and it unfortunately forms 60-70 % of all emergency admissions to any hospital. Trauma patients need the most important care since these are the patients who can be salvaged to the maximum.

Mahatma Gandhi Memorial Government Hospital, Trichy, attached to K.A.P.V Government Medical College is one of the tertiary centre for trauma in Tamilnadu in which majority of patients admitted to surgical triage ward are due to trauma. Systemic evaluation of these patients revealed orthopaedic and neurological injuries to be the most commonly encountered followed by abdominal trauma forming the third rank next to these injuries.

In our hospital hollow viscus injuries are the most commonly encountered abdominal injuries followed by the injuries to solid organs (liver, spleen, kidney). Solid organ injuries can be managed by both conservative and surgical management whereas hollow viscus injuries need emergency surgical intervention since delayed intervention carry a worst prognosis. Hence early diagnosis and intervention in these patients will bring a significant change in the final outcome .

AIM OF THE STUDY

- Complete systemic examination of all trauma patients admitted to triage ward.
- Identifying patients having or suspected to have abdominal injury.
- Appropriate investigations for those patients.
- To analyse mechanism of injury, organs involved and accompanying injuries in traumatic hollow viscus injuries.
- To analyse the different surgical procedures and finally the post operative outcome.

REVIEW OF LITERATURE

ABDOMINAL INJURIES

The primary concern of every practicing surgeon in a case of trauma is to resuscitate the patient by maintaining the airway, breathing, circulation and bring in hemodynamic stability.

Once the hemodynamic stability is achieved, the next immediate step is to investigate the patient for all possible injuries by complete systemic examination of all systems which will yield information about the possible injuries which should be confirmed by further investigations.

Orthopaedic injuries followed by neurological injuries are the most common injuries in trauma patients.

The next most commonly injured body region is the Abdomen which requires surgery in 20 % of the trauma patients.

In a multiple injury patient the assessment of intra abdominal injuries is very challenging .Injuries to solid organs(liver ,spleen, kidney, pancreas) can be assessed by investigational modalities .On the other hand hollow viscus injuries are mainly diagnosed by high index of clinical suspicion supplemented by investigations.

MECHANISM OF ABDOMINAL INJURY

The two main mechanisms by which abdominal injury occurs are

- blunt abdominal trauma
- penetrating abdominal trauma

Blunt abdominal trauma

Blunt trauma continues to be the most common mechanism of abdominal injury in case of road traffic accidents. Other causes of blunt trauma abdomen are accidental falls, train traffic accidents, work spot injuries and in the case of paediatric patients apart from accidents bicycling, falls and sexual abuse also contribute to abdominal injuries.

Penetrating abdominal trauma

It contributes to 15 – 25 % of abdominal injury and it is increasing in frequency in urban and semi urban areas. The common modes of penetrating injuries are Assault, RTA ,accidental fall over sharp objects and gunshot injuries out of which in indian setup assault with knife and sickle is more common .In a case of penetrating abdominal injury it is mandatory to do a thorough laparotomy for complete abdominal exploration.

Seat belt injuries

With the increase in number of four wheelers and usage of seat belts ,seat belt injuries have gained a special attention in hollow viscus injuries where a new type of avulsion injury is seen in head on collisions, where there is sudden high speed deceleration causing the abdominal contents to move forward against the well supported body causing the

avulsion of coils of bowel from mesentery thereby causing tearing in the mesentery and bowel at fixed points and contusion in the bowel as a result of impact.

CLASSIFICATION OF ABDOMINAL INJURIES

Abdominal injuries can be classified into the following types

- Solid organ injuries (liver , spleen)
- Hollow viscus injuries (stomach , intestines, etc)
- Urological injuries (kidney , bladder, etc)
- Vascular injuries to major abdominal vessels
- Injuries to perineum and pelvis.

CURRENT DIAGNOSTIC MODALITIES

Patients with abdominal trauma can be generally classified into the following categories based on their physiological condition. Following initial resuscitation, based on the haemodynamic status abdominal trauma patients can be categorised as follows:

- Normal – investigations can be full
- Stable – investigations limited
- Unstable – where immediate surgical intervention needed.

GENERAL PHYSICAL EXAMINATION

On receiving the patient in the trauma ward of the hospital a detailed history (if feasible) and complete examination of all organ systems would usually help us in diagnosing intra abdominal injury. The history and general clinical examination would be very helpful in determining intra abdominal injury in a consious , alert ,oriented patient who is well responsive although physical examination has some limitations in ruling out pelvic and retroperitoneal injuries. Furthermore in a haemodynamically compensated patient with mild to moderate bleeding peritoneal signs may be absent. Abdomen should be carefully inspected for bruises, pressure marks , patterned abrasions, petechiae, lower rib cage for any bruisies /contusions. General features of intra abdominal injury are shock, paralytic ileus, peritonitis. Intractable vomiting occurring as a late occurrence should rise a suspicion of visceral rupture either intraperitoneal or retroperitoneal. Bowel sounds have a limited value since audible bowel sounds can’t exclude serious visceral injuries and bowel sounds may be absent in spinal injuries, severe hypotension and retroperitoneal haematoma.

INVESTIGATIONS

Plain x ray chest

Plain x ray chest reveals us fractures of lower ribs thus raising suspicion of injury to liver , spleen, stomach. Sometimes abdominal contents can be found in chest x ray indicating a ruptured hemidiaphragm.

Plain x ray abdomen erect

Presence of air under diaphragm (pneumoperitoneum) indicates hollow viscus perforation but small visceral punctures may not be detected by x ray. Furthermore if there is intestinal stasis it may be revealed by dilated bowel loops. In unconscious and unstable patients who are not able to stand lateral decubitus x ray may detect pneumoperitoneum. Plain x ray abdomen can also detect bony injuries to pelvis.

Diagnostic peritoneal lavage

Indications

- Physical examination not giving any conclusions
- Unexplained severe hypotension or shock
- Patients on drugs with altered sensorium
- Closed head injury patients

- Spinal Cord injury patients.

Contra indications

- Definite indication for exploratory laparotomy.
- Patients undergone previous exploratory laparotomy
- Pregnant patients

Procedure

By subumblical incision the peritoneal lavage catheter is introduced into peritoneal cavity through which one litre normal saline is introduced and the patient is turned to both left and right and fluid is collected back and sent for cytology , culture ,microscopy and biochemical analysis.

Diagnostic Peritoneal Lavage is significant when aspirated fluid contains

- gross blood of 10 ml
- >100000/mm3 of RBC
- >500/mm3 of WBC
- Bile, bacteria or food fibres
- Amylase>175 units/dl

Sensitivity

Sensitivity for detecting intraperitoneal blood is 97-98%

Complications

It is 1-2%

Now FAST has largely replaced DPL.

Focused abdominal sonar for trauma (FAST)

It is an ultrasound technique used for assessing the presence of blood in the abdomen or chest and not to determine the specific injury. FAST is a rapid, portable non invasive bed side test which can be performed along side with resuscitation. FAST is accurate for detecting free blood >100 ml.

Sensitivity

Low sensitivity (30 -35%) .

Advantages

- Non invasive
- Non radioactive
- Useful in triage ward or ICU
- Low cost

Disadvantages

- Operator dependent
- Low detection rates in obese individuals
- Interposition of gas
- Sensitivity decreased if amount of free fluid is less than 500 ml
- False-negatives: injuries in retro peritoneum, injuries to hollow viscus organs, injuries in penetrating trauma

Computerised Tomography (CT)

The revolution in the management of abdominal trauma came after the invent of CT scan. With CT abdomen we can completely assess the lower chest, abdomen , pelvis and can identify the injured organ as well as decide to which injury to be managed surgically and conservatively.

Indications

- Blunt abdominal trauma
- Haemodynamically stable patients
- Inconclusive abdominal examination
- Physical examination not reliable
- Suspected duodenal or pancreatic injury
- Head injury patients
- Spinal cord affected patients

Contra indications

- ❖ Definite indication for emergency laparotomy.
- ❖ Patients who are haemodynamically unstable
- ❖ Agitated patients
- ❖ Contrast media allergy

Oral contrast is helpful in suspected duodenal injury. Rectal contrast is helpful in distal colon and rectal injury.

Disadvantage: Hollow viscus injuries can't be diagnosed with reliability.

In CT if free fluid is present in the absence of solid organ injury we should suspect injury to mesentery ,intestine or bladder and emergency laparotomy is indicated .Bowel thickening ,minimal free fluid in the vicinity of injury ,minimal free fluid between loops of intestine can also be diagnosed with higher two dimensional or three dimensional reconstructions.

- ❖ Accuracy of CT scan is 94-96%
- ❖ Sensitivity is 92-97%
- ❖ Specificity is 74-99%.

Diagnostic laparoscopy

Useful diagnostic tool in penetrating abdominal trauma, where peritoneal breach is suspected in stable patients and it is inappropriate in haemodynamically unstable patients.

Disadvantage is that laparoscope cant diagnose all of the intra abdominal organ injuries like spleen , small bowel and retroperitoneal injuries. If haemoperitoneum is diagnosed emergent exploratory laparotomy is indicated.

Pre**operative management**

Stabilise and maintain the haemodynamic status of the patient by transfusing adequate crystalloids, colloids and blood transfusion. Ryles tube insertion and catheterisation of bladder. Appropriate higher antibiotics.

TRAUMATIC HOLLOW VISCUS INJURIES

GASTRIC INJURIES

Incidence is < 1% due to two reasons:

1) Anatomical location : being located mostly under the lower ribs.
2) Excessive mobility

Gastric injuries mostly occurs when stomach is distended-postprandial state.

High velocity trauma to lower part of chest and upper part of abdomen causes rapid deceleration gastric injuries which are usually associated with injuries to spleen and thorax and hence carry a higher rate of mortality .Penetrating abdominal trauma causes full thickness injury to stomach .Blunt abdominal trauma causing secondary gastric rupture is extremely rare. In blunt trauma the force may lead to devascularisation of stomach hence leading to focal necrosis which may ultimately result in delayed presentation.

The order of incidence of gastric injury is

- Anterior wall of stomach-41%
- Greater curvature of stomach-25
- Lesser curvature of stomach-16%
- Posterior wall of stomach-14%

If the patient presents with complaints of haematemesis or on ryles tube aspiration fresh blood is being aspirated then clinically gastric injury should be suspected. Plain x ray abdomen erect may reveal air under the diaphragm (pneumoperitoneum).In these patients use of CT and ultra sound (FAST) is very limited.DPL may be useful in these patients. Stomach injuries can be diagnosed by using water soluble contrast medium studies .Gastric injury patients should be taken up for emergent exploratory laparotomy after aggressive initial resuscitation. During surgery a good and complete look of the stomach must be made after mobilization. After dividing the gastrocolic omentum (avascular portion) and left triangular ligament ,the lesser sac and posterior wall of stomach can be well visualized. Ligation of two or even three major blood vessels is very well tolerated since the stomach is a highly vascular organ .If there is haematoma in wall of the stomach it should be immediately explored, evacuated and the defect closed with lembert's sutures. Small lacerations are sutured with two layered repair. Wounds in pylorus may require pyloroplasty. If there is severe damage to antrum or pylorus then Billroth I or II procedure is advisable. Extensive wounds not amenable to suturing may need proximal or distal gastrectomy .If vagus nerve or both nerves of Latarjet are injured then the patient requires a pyloroplasty or a drainage procedure. Since the stomach is highly vascular a two layered suture is generally advisable.

Complications after surgery:

a) Haemorrhage from submucosal vessels
b) Post op peritonitis with abscess
c) Gastric fistula
d) Empyema when gastric injury is associated with thoraco abdominal injury.

After penetrating abdominal trauma causing gastric injury

Mortality due to gastric injury alone-6-7%

When associated with other injuries

Morbidity-26%

Mortality-15%

DUODENAL INJURIES

Incidence:- 4-6%.

Mechanism of injury:

a) Majority due to penetrating trauma(78%)
b) Blunt trauma(22%)

Usually duodenal injuries are associated with other intra-abdominal organ injuries since duodenum in its anatomical relation is close with major solid organs and major blood vessels. In duodenum the most commonly injured is the second part and third part .

Mode of injury

Crush injury - causing blow to abdominal wall as in the case of steering wheel injury.

Bursting - due to a powerful blow injury to abdomen causing pylorus and ligament of treitz to contract simultaneously.

Shearing –due to sudden deceleration mobile segments shear off from fixed parts.

Since the second and third part of duodenum are retroperitoneal, it is usually well protected against injuries ,but the disadvantage is that early diagnosis is` also prevented. Isolated duodenal injury is rare and doesn't usually present with features of peritonitis or shock and hence injuries to duodenum are difficult to diagnose. The patient may present with vague symptoms or mild abdominal pain. General examination would be inconclusive since features of peritonitis appears late owing to the anatomical (retroperitoneal)location of duodenum. If there is an intra mural haematoma causing obstruction then bilious vomiting appears but usually late. In cases of duodenal injury serum amylase level may be elevated.

Plain x ray abdomen erect shows

- scoliosis
- obliteration of the shadow of right psoas muscle.
- duodenal bulb with no air in it.
- Retroperitoneal air encircling the kidney

After oral contrast through the ryles tube ,coiled spring or stacked coin sign- indicates intramural haematoma in duodenum. If there is duodenal perforation then there will be extra luminal contrast or air. In suspected cases of duodenal injury CT with contrast (intraluminal and intravenous) is the investigation of choice which may reveal

a) thickening of bowel wall
b) intraluminal haematoma
c) extraluminal contrast ,fluid, gas
d) retroperitoneal oedema and air.

But majority of duodenal injuries are diagnosed only during laparotomy.

DUODENAL INJURY-GRADING

GRADE	**TYPE OF INJURY**	**DESCRIPTION OF INJURY**
I	-Haematoma -Laceration	- Involving a single portion of the duodenum - Partial thickness injury, no perforation
II	-Haematoma -Laceration	-more than one portion -disruption <50%circumference

III	-Laceration	-disruption of 50-75%of circumference of 2nd part of duodenum; disruption 50-100%of 1st ,3rd or 4th part of duodenum
IV	-Laceration	-disruption of >75% of 2nd part of duodenum and distal CBD or ampulla
V	-Laceration -Vascular	-duodenopancreatic complex gets severely disrupted -duodenal devascularisation

MANAGEMENT

In case of duodenal haematomas,

- Ryles tube aspiration till resumption of peristalsis.
- Expected time to resolve - 10 to 15 days.
- Indication for exploration is duodenal obstruction which is persistent and not responding to conservative line of management.

For Grades One and Two injury when diagnosis is made within 6 hours of injury, treatment is simple primary repair of the defect. After six hours since there is increased risk for possibility of leakage, decompression of duodenum in any form (transpyloric ryles tube, tube jejunostomy, or tube duodenostomy) is preferable.

In case of Partial thickness injury – buttress with silk lembert's (seromuscular) sutures is prefered.

In case of Full-thickness wounds- debridment up to healthy tissue and defect repaired transversely in one or two layers, either interrupted or continuous.

In Grade Three injuries where majority of the duodenal circumference gets disrupted treatment is by repair of the defect primarily with exclusion of pylorus, and a procedure for drainage or, a Roux-en-Y duodenojejunostomy can be done.

In Grade Four injuries (where distal CBD or ampulla is involved) repair is very difficult. In such a condition, surgical repair of the duodenum primarily, repair of the CBD, and placement of a T-tube with a long transpapillary limb or a choledochoenteric anastomosis may be tried if feasible. If CBD repair is not possible, ligation and a second intervention for a biliary enterostomy can be done.

For grade Five injuries where the majority of duodenum gets disrupted and there is massive disruption of head of pancreas or duodenum encounters a massive devascularization, Pancreaticoduodenectomy is reserved for these cases.

Complications

The incidence ranges from 25% to 100%. Duodenal fistula formation is the most significant complication, occuring in 7% to 16% of patients. The factor contributing to failure of duodenal repair and thus leading to formation of duodenal fistula is the large amount of digestive fluids (about 10 liters) passing through duodenum comprising mixture of bile ,chyle and pancreatic secretions. Duodenal fistulas are managed conservatively with ryles tube aspiration, IV fluids with nutritional support, and good stoma care. By these means the duodenal fistula usually closes by 6 to 8 weeks.

Prevention of duodenal fistula

Lateral tube duodenostomy

Triple tube ostomy

Berne’s duodenal diverticulization - Vagotomy combined with antrectomy and GJ (gastrojejunostomy) with T-tube biliary drainage followed by oversewing of duodenal stump and lateral tube duodenostomy.

Vaughn’s pyloric exclusion with gastro jejunostomy

SMALL INTESTINE AND MESENTERIC INJURIES

In blunt abdominal trauma the Small bowel ranks the third commonly injured organ and it accounts for 5% to 20% in patients requiring surgical intervention. In penetrating injury abdomen it is the most common organ to get injured.

Mechanism of injury

1. Crushing injury-where bowel gets crushed between the vertebrae and the object causing injury, eg. steering wheel of four wheelers , two wheeler handlebars.
2. Rapid deceleration injury causing shearing of the small intestine at fixed points, like around mesenteric artery, ileocecal valve, the ligament of Treitz.
3. Closed-loop rupture caused due to a rapid abnormal elevation in intra abdominal pressure.

It is said that 20% of patients presenting with seat belt sign will have an associated small bowel perforation.

Hollow viscus injuries are often characterized by delay in the diagnosis and management of blunt hollow viscus injuries is associated with increased morbidity and mortality, as shown by recent studies.

On clinical examination these patients will have abdominal tenderness, rebound tenderness, guarding, rigidity ,and silent abdomen on auscultation. Plain X ray often shows pneumoperitoneum.. CT abdomen

shows free fluid, pneumoperitoneum, and small bowel wall thickening or thickening of mesentery.

During exploratory laparotomy, all haematomas in the mesentery should be explored thoroughly since small sized injuries in bowel wall might be hidden by them. The small intestine is examined completely since multiple perforations can be present at various sites due to impact of trauma. If there is bleeding it should be controlled early and to prevent the intestinal contents from spilling it is necessary to apply the clamps early.

Small Intra mural haematomas are sutured with inverted Lembert's suturing with 3-0 silk. Debridment with primary suturing can be done if the circumference of the bowel wall involved is <50%.Resection and anastomosis is indicated in wounds involving >50% of circumference of bowel wall, multiple small perforations, and large tears in the mesentery where the viability of bowel is compromised.

Postoperative complications:

- intraabdominal abscess
- leakage from anastomotic site
- infection in wound site
- sepsis
- enterocutaneous fistulas

- intestinal obstruction.

If small intestine is extensively resected it results in short bowel syndrome which is a dreadful complication.

COLONIC INJURIES

Colonic injuries are commonly encountered in penetrating abdominal trauma and it is the third common organ to be involved in stab injury. After blunt abdominal trauma colonic injuries are relatively rare accounting for 0.4-5% of all intra abdominal injuries.

Morbidity following colonic injury is 19%-35%.

Mortality following colonic injury is 4%-15%.The increased frequency of infections following injury to colon is either due to inadequate antibiotic treatment or due to delayed diagnosis. Infective complications can be reduced significantly if a colonic injury is repaired within two hours of injury. Sigmoid colon is the most common site to get injured.

Mechanism of injury:

- Crushing injury causing direct compression of colon
- Sudden deceleration in trauma.

Presence of frank blood on per rectal examination indicates rectal or colon injury. Plain x ray abdomen erect may reveal free air. But more

sensitive investigation is DPL when it is performed <4 hrs of injury. CT scan with contrast (oral, rectal and IV) usually reveals colon injuries.

COLONIC INJURIES GRADING

Grade 1 – laceration (partial thickness):haematoma or contusion

Grade 2 – laceration of small size involving less than 50% circumference.

Grade 3 – laceration of large size involving greater than 50% circumference.

Grade 4 – Colonic transaction

Grade 5 – when transaction associated with tissue loss; devascularised segment.

Treatment protocol for colonic injuries is as follows:

For Grade 1 or Grade 2 – haematomas evaluated, primarily closed.

For Grade 3 – primary closure of injuries when no risk factors favouring colostomy are present.

For Grade 4 – colostomy is preferred or repair with proximal diversion.

For large grade 4 injuries involving caecum and right colon-resection and ileostomy is preferred.

For Grade 5 - colectomy and colostomy

Proximal diversion alone should not be done.

Factors favouring colostomy are :

- Old age patients
- Association with multi organ injuries.
- Massive transfusion of blood.
- Pre-operatively haemodynamically unstable patients.
- Contaminated wounds.
- Delayed therapy.
- Doubtful bowel viability.
- When repair is difficult or insecure.

Postoperative complications:

- Formation of abscess.
- Leak from anastomotic site.
- Hernia from peri stomal region.

INJURIES TO RECTUM

Usually injuries to rectum are uncommon .When pelvic fractures are present rectal injuries can be suspected. Rectal injuries are usually common after penetrating trauma like gunshot injury .Rectal injuries may be either intra peritoneal or can be extra peritoneal. Per rectal examination may reveal a laceration, frank blood on examining fingers or fragments of bone when associated with pelvic fractures. Extra peritoneal rectal injuries are difficult to diagnose and repair since they show very few clinical signs. In case of extraperitoneal injuries, present in the lower one third of rectum primary closure can be tried, though they are not always possible. In such cases a proximal diverting colostomy with washout of the distal injured rectal stump, and a wide presacral drainage is mandatory. On the other hand intraperitoneal rectal injuries are treated with primary closure and diverting colostomy. When rectal injuries are extensive then the preferred treatment is Primary abdominoperineal resection.

Complications:

- Septicaemia
- Abscess formation especially in pelvis
- Fistula formation (rectal or urinary)
- Incontinence of rectum and urine
- Rectal stricture &sexual dysfunction.

RECENT ADVANCES IN TRAUMATIC SURGERY

DAMAGE CONTROL SURGERY

Prolonged surgery in a major trauma patient with unstable physiological status associated with a triad of acidosis, coagulopathy and hypothermia leads to an increased mortality rate, which led to concept of damage control surgery and its goal is to reduce the time of surgery which helps to correct the derangement in physiological status in a better way ,hence leading to an improved outcome

Sur**gery in such cases is restricted to achieve two goals**

- Active bleeders to be stopped.
- Contamination control – primary repair of the injury, resection of bowel with staplers or bowel ligation with an umblical tape or its equivalent.

The further surgery is then withheld and the skin alone is closed. Sometimes the wound can be covered with plastic implant devices. The patient is then shifted to surgical ICU for effective resuscitation to correct the deranged physiological status. After two to three days when the physiology of the patient is stabilised the patient is taken up for surgery for reexploration.

Damage control surgery - A staged process

Stage I – Selection of patients

Stage II – Control of bleeding and contamination control.

Stage III – Further resuscitation in surgical intensive care unit.

Stage IV – Definitive re exploration surgery

Stage V – Closure of abdomen

Indications

Anatomical

- Not able to achieve haemostasis.
- Abdominal injury which is complex.
- Combined hollow viscus, vascular and solid injury.
- Major venous injury which is inaccessible.
- Other injuries demanding non surgical control.
- When prolonged procedure anticipated.

Physiological

- Hypothermia (< 34 º C)
- Acidosis (< 7.2ph)
- Serum lactate > 5 m mol / l
- Prolonged prothrombin time > 16 s
- Prolonged partial thromboplastin time > 60 s

- Massive blood transfusions (> 10 units blood)
- Hypotension (BP < 90 mm Hg)

Environmental

- Duration of surgery > 60 min.
- Abdominal incision being inable to approximate.
- When intra abdominal contents have to be further reassessed.
- Unnecessary delay in re exploring the abdomen increases the risk of septicemia and the worsening of the previously unnoticed injuries. Abdomen closure is done as soon as possible keeping abdominal compartment syndrome in mind.

Complications:

Wound complications

- Infection
- Abscess formation
- Fistula formation.

Mortality-12%

Morbidity is not related to severity of injury but associated with suture materials used, mesh used(absorbable or non absorbable),method and timing of closure of wounds.

Lower complication rates have found to be associated with delayed primary closure in first week after traumatic injury.

ABDOMINAL COMPARTMENT SYNDROME

Normal intra abdominal pressure is 2-12 mmHg. When intra abdominal pressure is greater than 12mmHg the condition is called Abdominal compartment syndrome .It occurs in multitrauma patients with bowel oedema and ileus, patients in severe shock requiring massive blood transfusions and resuscitation fluids and in major vascular or visceral intra abdominal injuries.

Characteristic features:

- Upward displacement of diaphragm.
- Increased peak inspiratory pressure ,CVP,PCW
- Oliguria
- Hypoxia, hypercapnia, acidosis and hypotension
- Decreased venous return to heart.

Diagnosis

Confirmation of diagnosis by measuring bladder pressure.

Treatment:

It is a surgical emergency. Immediate decompression of abdomen by opening the abdominal wound and temporary abdominal wall closure with mesh or a plastic bag (Bogota bag) without suturing fascia or closing the skin edges. Nowadays, vacuum assisted abdominal closure is gaining importance.

Undue delay in decompression of abdomen results in ischemia of intestines. So early intervention is utmost important. But rapid decompression may lead to reperfusion injury resulting in cardiac arrest in asystole , arrhythmia, acidosis and hyperkalemia which can be avoided by adequate volume preload with use of crystalloids.

MATERIALS AND METHODS

CASE SELECTION

The study population are those patients admitted in surgical triage ward in Mahatma Gandhi Memorial Government Hospital (M.G.M.H), Trichy with hollow viscus injuries.

INCLUSION CRITERIA

- All trauma patients with abdomen injury greater than 13 yrs of age
- Both Blunt injury and Penetrating injury abdomen included.

EXCLUSION CRITERIA

- Patients with isolated solid organ injuries.
- Paediatric age group patients (<12 yrs)

MODE OF EVALUATION

- Detailed history and complete physical examination of all the trauma patients.
- Blood investigations.(complete blood count, Renal function tests)
- Blood grouping and typing.
- Chest X-ray PA view
- X-ray abdomen erect
- USG abdomen & pelvis

- ❖ CT scan abdomen and pelvis.
- ❖ Paracentesis

STUDY DESIGN

- ❖ It is a prospective non randomized descriptive study
- ❖ Duration of study – January 2012 to November 2013
- ❖ Ethical committee clearance obtained.
- ❖ An informed written consent obtained either from the patient or from their reliable attenders.
- ❖ Collected data were analyzed using statistical methods.

OBSERVATION & RESULTS

- Total number of trauma patients admitted to surgical triage ward during the study period – 9660.
- Patients suspected of having abdominal injury – 2070
- Patients who were completely evaluated and found to have abdominal injury – 74.
- Patients with solid organ injury alone – 26
- Patients with hollow viscus injuries – 48.

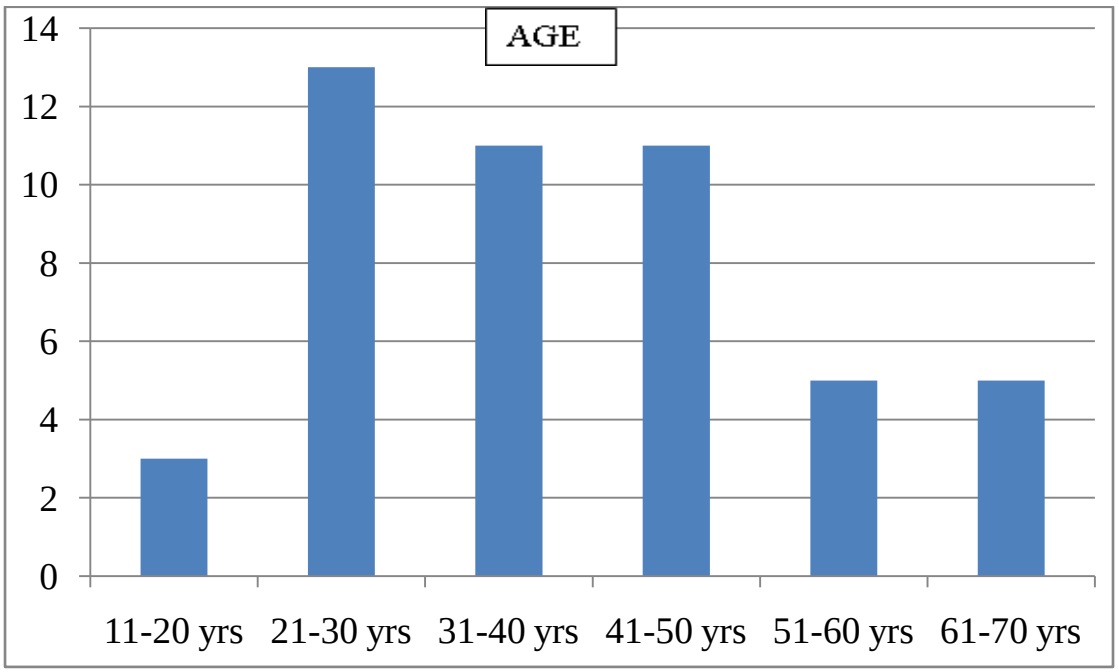
AGE

There is a wide range in presentation of patients-the youngest patient being 16 years and oldest patient being 65 years of age.

The mean age of presentation of patients is 40 years with a standard deviation of 13.76 years.

Traumatic hollow viscus injuries is distributed age wise as follows:

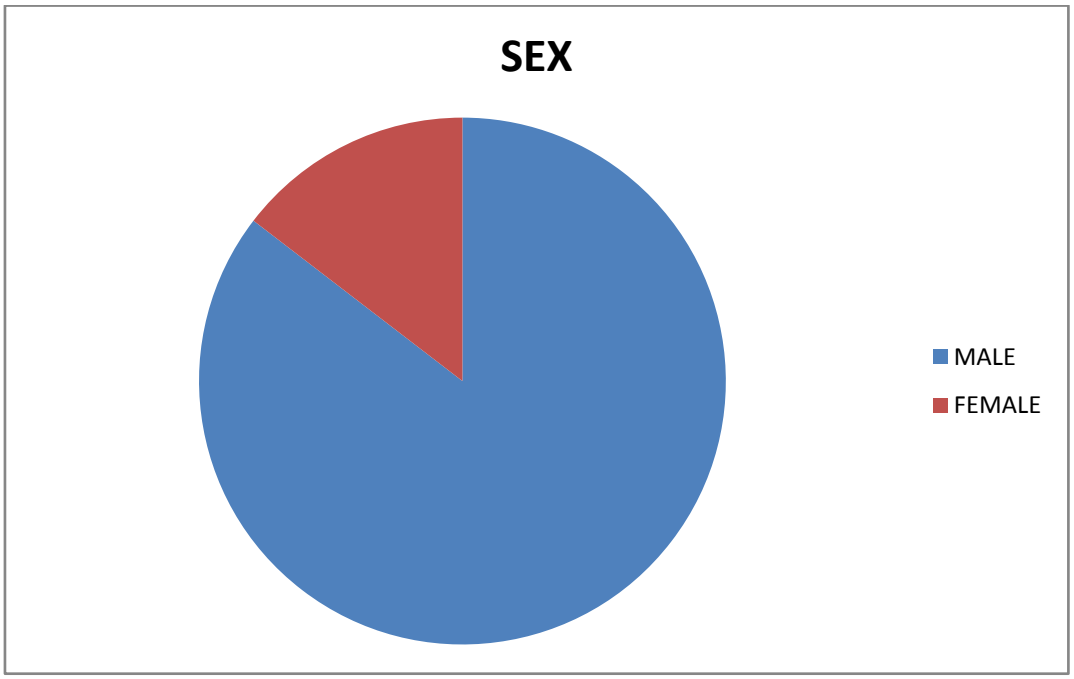
Age distribution	Total no of patients	Percentage
11-20	3	6.25%
21-30	13	27.08%
31-40	11	22.91%
41-50	11	22.91%
51-60	5	10.41%
61-70	5	10.41%



SEX

Sex wise distribution is as follows

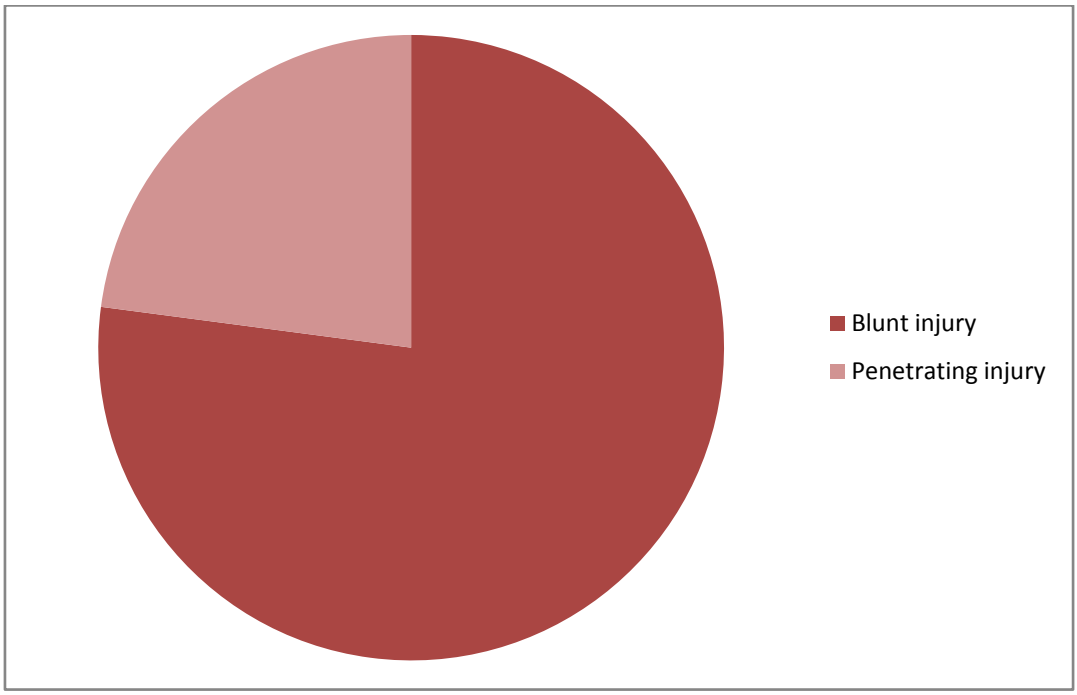
Sex	Total no of patients	Percentage
Male	41	85.42%
Female	7	14.58%



MODE OF INJURY

Mode of injury	No of patients	Percentage
Blunt injury	37	77.08%
Penetrating injury	11	22.92%

MODE OF INJURY

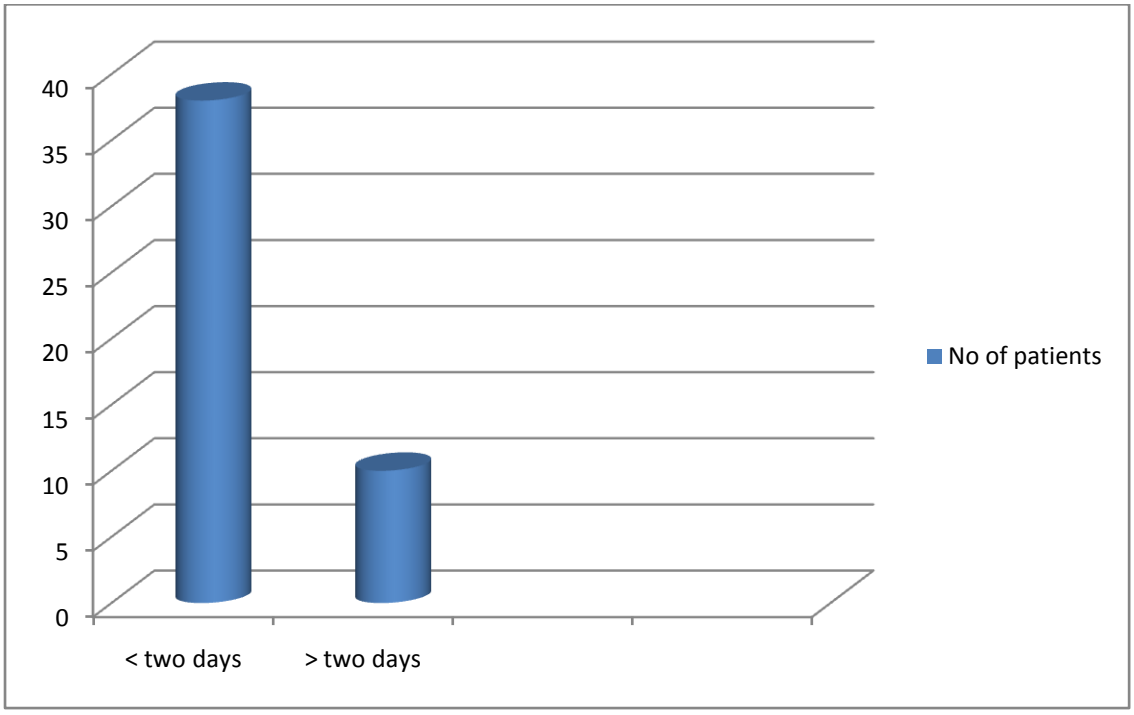


TIME OF REFERENCE

Here patients are grouped into two as who are being referred within or above two days after the history of abdominal trauma

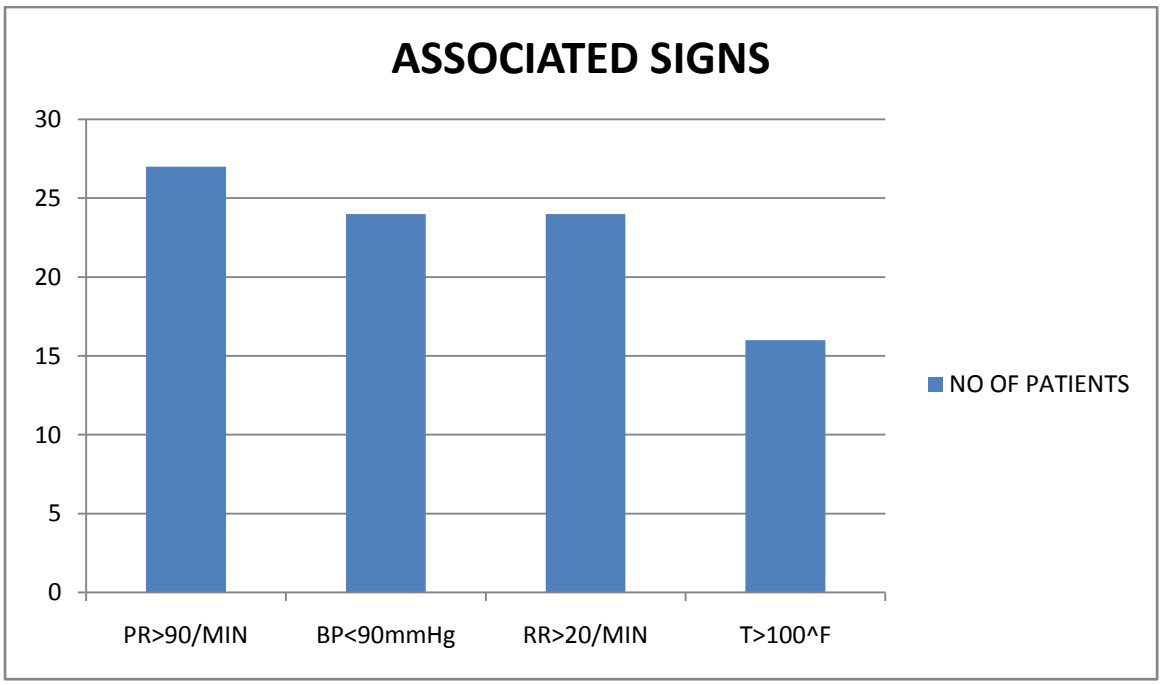
Time of reference	No of patients	Percentage
< two days	38	79.16%
>two days	10	20.84%

TIME OF REFERENCE



ASSOCIATED SIGNS

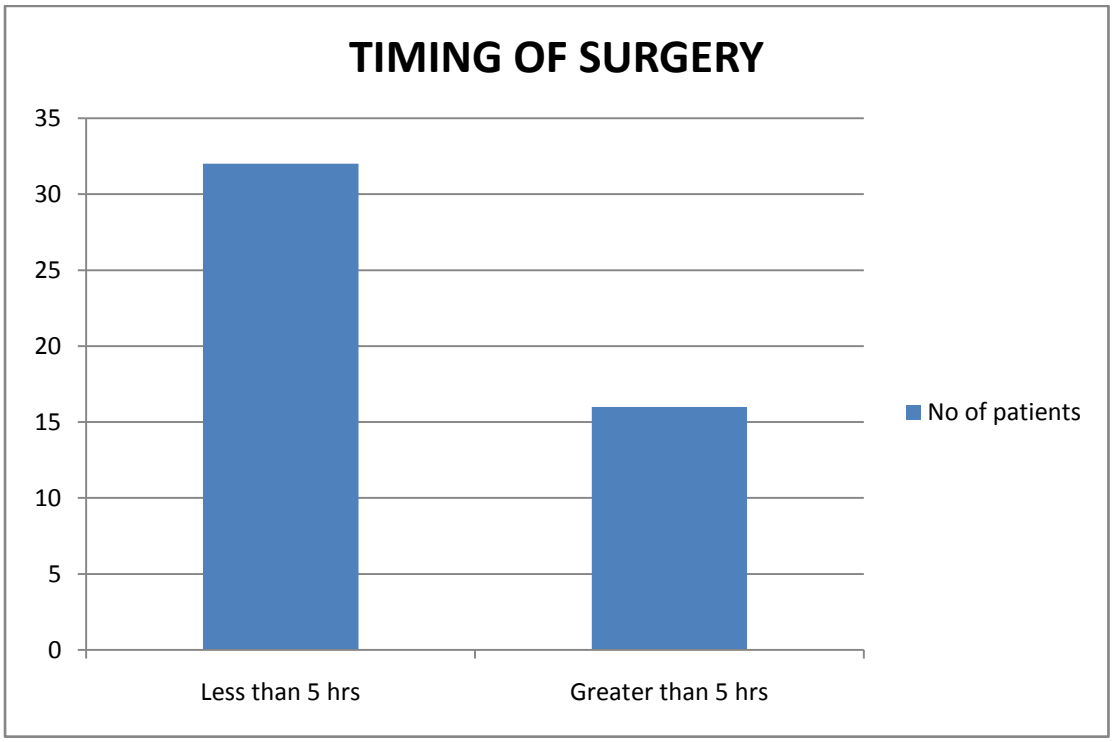
SIGNS	NO OF PATIENTS	PERCENTAGE
PULSE RATE>90/MIN	27	56.25%
BLOOD PRESSURE<90 mmHg	24	50%
RESPIRATORY RATE>20/MIN	24	50%
TEMPERATURE>100^F	16	33.33%



TIMING OF SURGERY

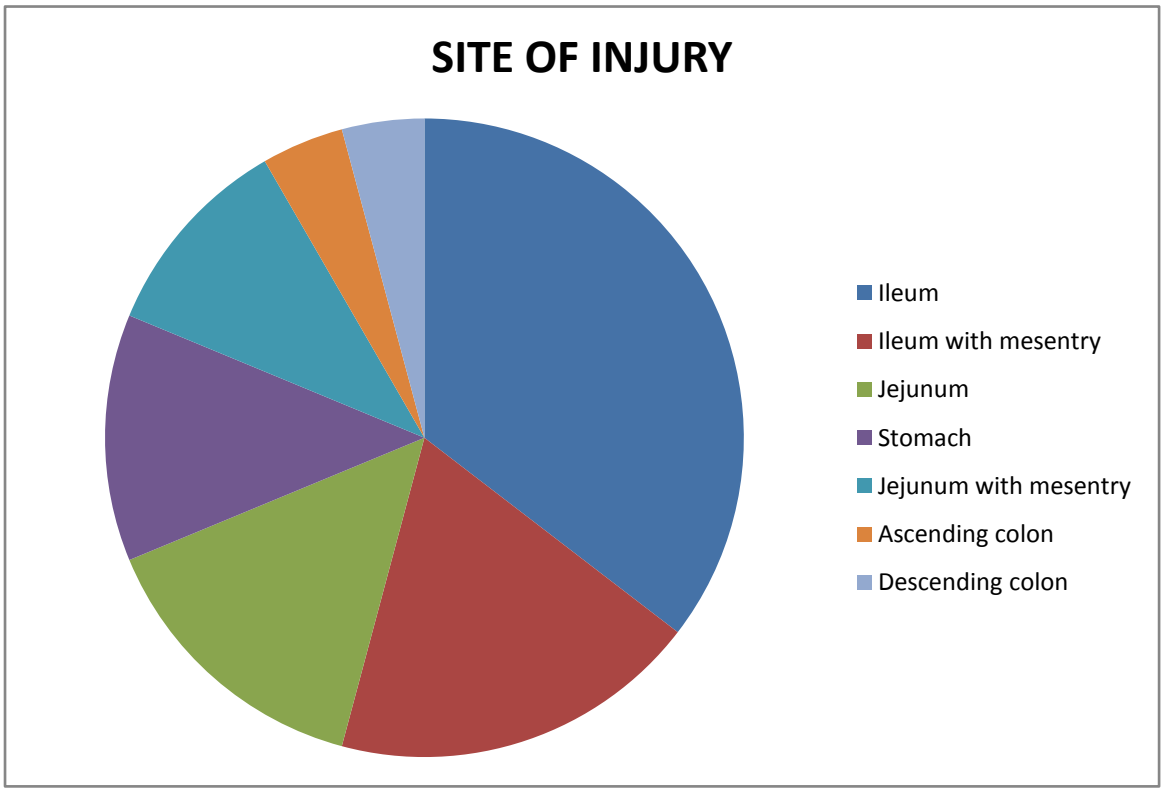
On the basis of surgery being performed within or more than five hours after presentation to the hospital ,these patients are divided into two groups:

Timing of surgery	No of patients	Percentage
Less than 5 hrs	32	66.68%
Greater than 5 hrs	16	33.33%



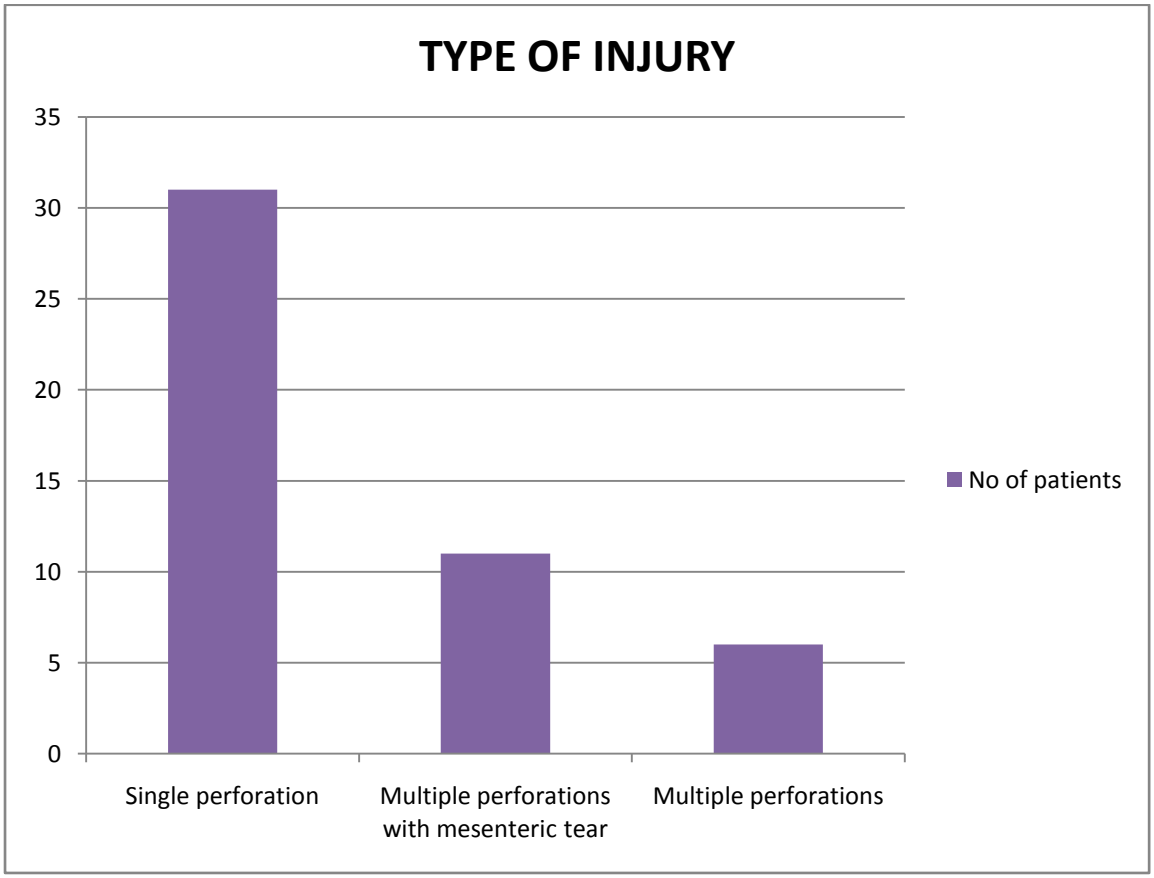
SITE OF INJURY

Site of injury	No of patients	Percentage
Ileum	17	35.41%
Ileum with mesentery	9	18.75%
Jejunum	7	14.58%
Stomach	6	12.50%
Jejunum with mesentery	5	10.41%
Ascending colon	2	4.16%
Descending colon	2	4.16%



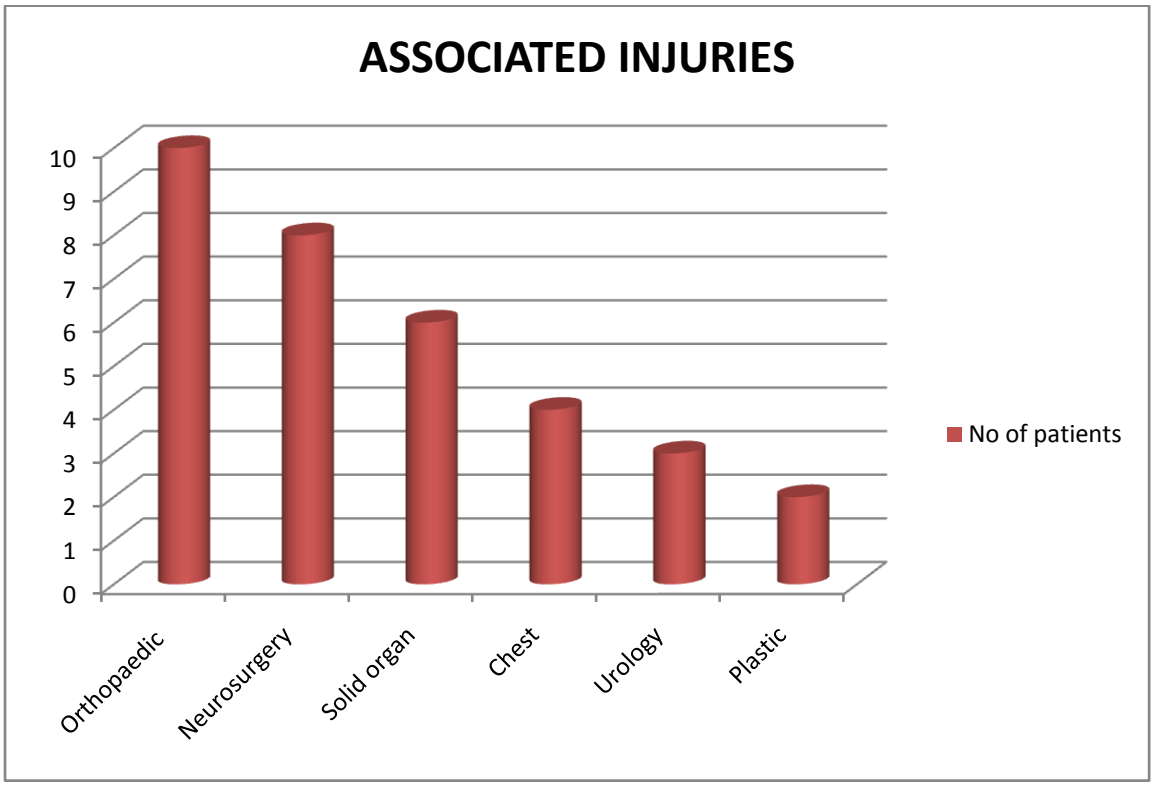
TYPE OF INJURY

Type of injury	No of patients	Percentage
Single perforation	31	64.58%
Multiple perforations with mesenteric tear	11	22.91%
Multiple perforations	6	12.50%



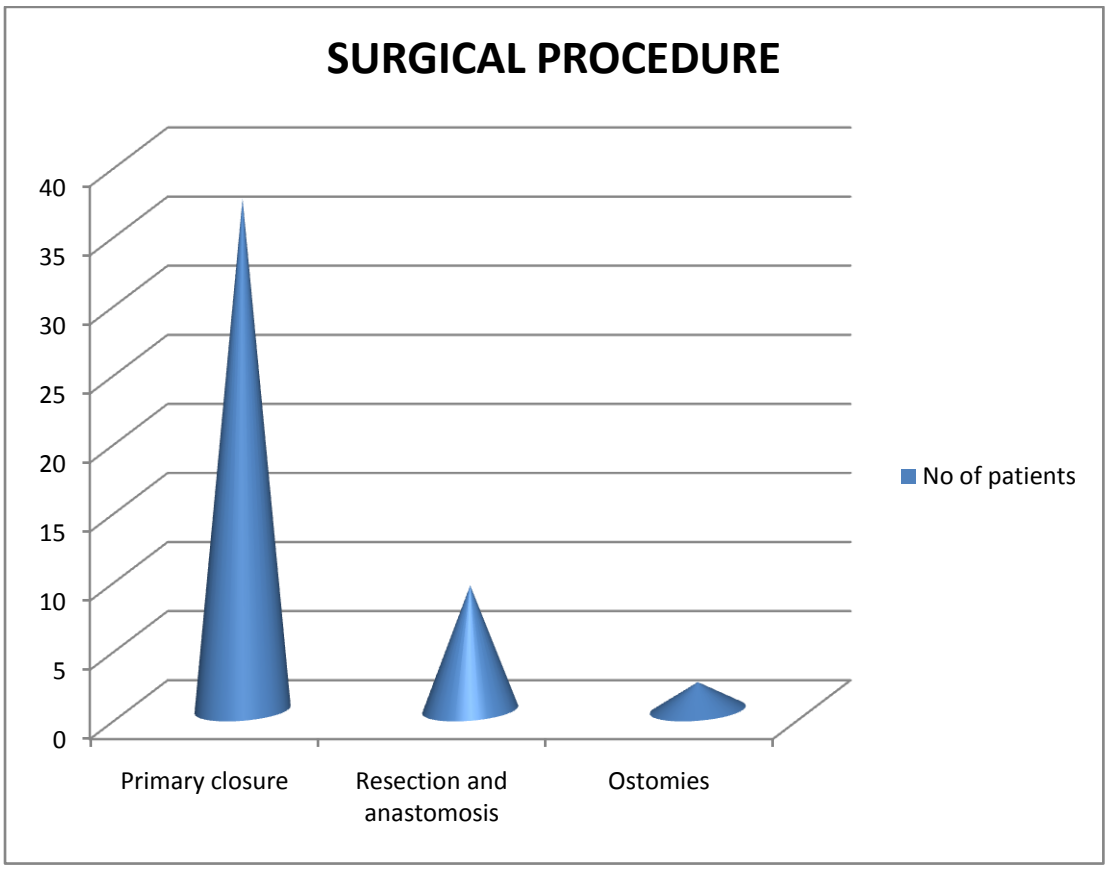
ASSOCIATED INJURIES

Associated injuries	No of patients	Percentage
Orthopaedic	10	30.30%
Neurosurgery	8	24.24%
Solid organ	6	18.18%
Chest	4	12.12%
Urology	3	9.09%
Plastic	2	6.06%



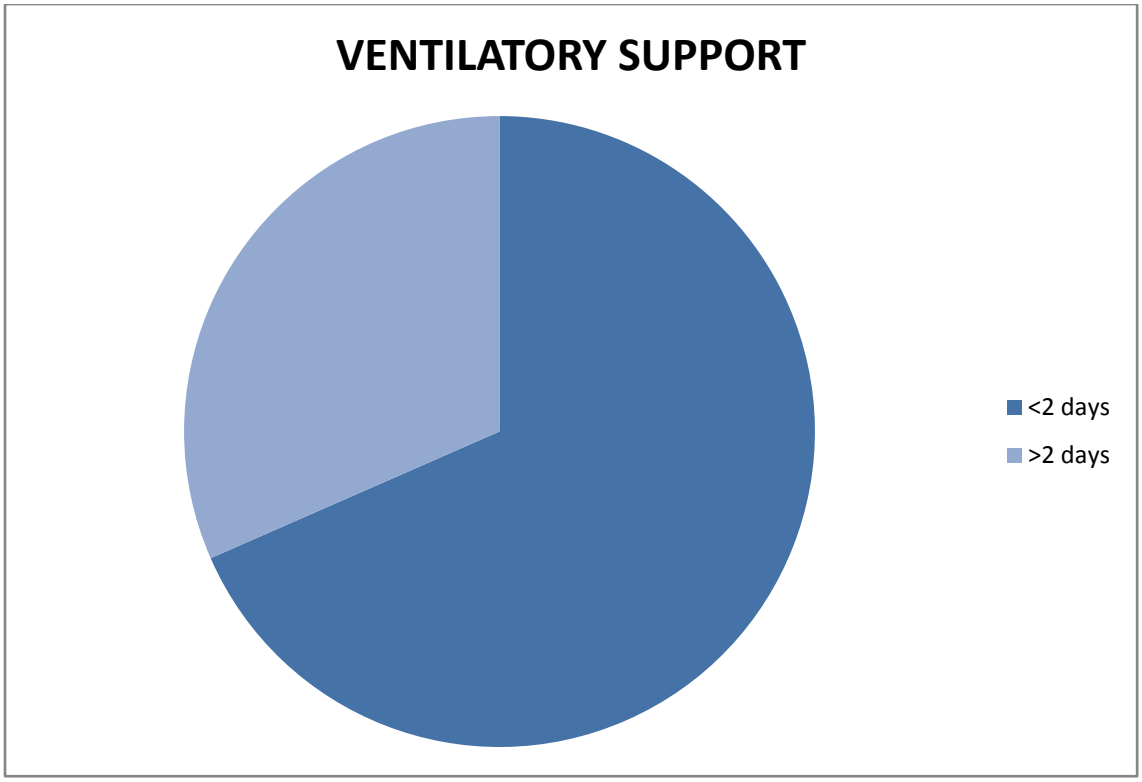
SURGICAL PROCEDURE

Surgical procedure	No of patients	Percentage
Primary closure	37	77.08%
Resection and anastomosis	9	18.75%
Ostomies	2	4.16%



VENTILATORY SUPPORT

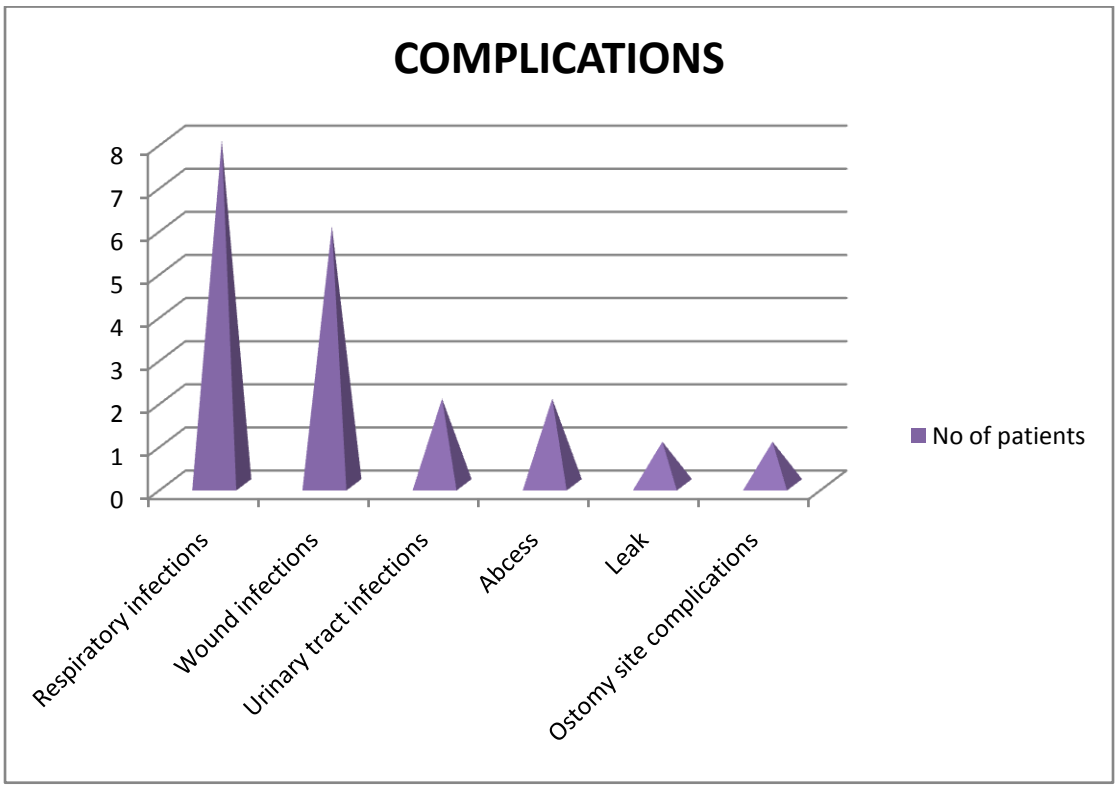
Ventilatory support	No of patients	Percentage
<2 days	13	27.08%
>2 days	6	12.50%



COMPLICATIONS

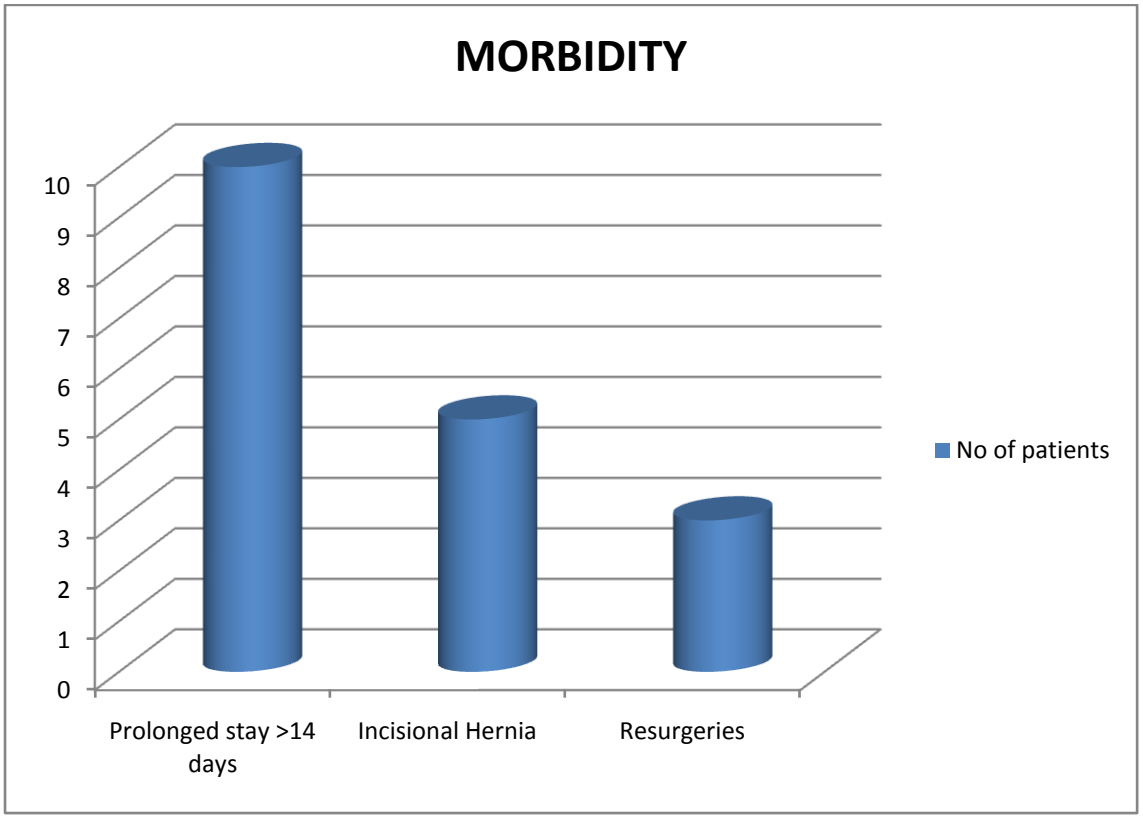
Total number of post operative patients who had complications- 20(41.66%).

Complications	No of patients	Percentage
Respiratory infections	8	16.67%
Wound infections	6	12.50%
Urinary tract infections	2	4.16%
Abcess	2	4.16%
Leak	1	2.08%
Ostomy site complications	1	2.08%



MORBIDITY

Morbidity	No of patients	Percentage
Prolonged stay >14 days	10	20.83%
Incisional Hernia	5	10.41%
Resurgeries	3	6.25%



MORTALITY

Overall mortality -13 (27.08%).

Mortality in isolated injuries -4 (8.33%).

Mortality in poly trauma patients -9 (18.75%).

Mortality in relation to ventilator support

Ventilatory support	**No of patients**	**Mortality**	**Percentage**
< 2 days	13	2	4.16%
>2days	6	3	6.25%

Mortality in relation to time of reference

Time of reference	**No of patients**	**Mortality**	**Percentage**
<2 days	38	8	21.05%
>2 days	10	5	50%

Sl.No	GROUPS	DEATH	ALIVE	CHI-SQUARE TEST X2=S(O-E)2/E	P VALUE
1	<2 days	8	30	3.36	<0.05
2	>2 days	5	5		

Hence from the above reference table we can infer that increased mortality is associated with delayed referral (>2 days), which is significant statistically.

Mortality in relation to time of surgery

Time of surgery	No of patients	Mortality	Percentage
<5 hours	32	4	8.33%
>5 hours	16	9	18.75%

Sl.No	GROUPS	DEATH	ALIVE	CHI-SQUARE TEST X2=□ (O-E)2/E	P VALUE
1	<5 hours	4	28	10.62	<0.001
2	>5 hours	9	7		

Hence we infer from the above table that increased mortality associated with delayed surgery is significant, statistically.

DISCUSSION

The data collected for the prospective study on traumatic hollow viscus injuries in Mahatma Gandhi Memorial Government Hospital (M.G.M.H), Trichy was analysed statistically. All the patients admitted to surgical triage ward were analysed and out of the 9660 trauma patients admitted about 2070 patients were suspected of having abdominal injury and hence were further evaluated. Abdominal injuries were diagnosed in only 74 patients. Of these 74 patients Isolated solid organ injuries were found in 26 patients either pre operatively or intra operatively. Thus they were excluded from the study and only 48 patients were taken up for the study. This shows that traumatic hollow viscus injuries are more common than solid organ injuries (64.86% Vs 35.13%). Hence the incidence of hollow viscus injuries is more common than solid organ injury

AGE INCIDENCE:

The following table compares the incidence of traumatic hollow viscus injuries in various age groups in the present series to that of the Davis et al.[5]

Age distribution[yrs]	Present Series	Davis et al
11-20	6.25%	19%
21-30	27.08%	24%
31-40	22.91%	15%
41-50	22.91%	13%
51-60	10.41%	6%
61-70	10.41%	3%

From the above table we infer that the majority of patients belonged to 21-30 years of age group. In Davis et al[5] study the majority of patients belonged to 21-30 years age group. Therefore it can be concluded that the young and the productive age group people are the usual victims of traumatic hollow viscus injuries.

SEX INCIDENCE.

Sex	Present study	Davis et al
Male	85.42%	70%
Female	14.58%	30%

In our study there is a clear male sex preponderance (85.42% Vs 14.58%) . The male to female ratio is 5.8 : 1 which is slightly higher than those seen in the western references ,as, in India males are the chief bread earner for the family and are involved in outdoor activities most of the times.

SIGNS

In our study the common signs were tachycardia(56.25%),followed by hypotension(50%),tachypnea(50%)&elevated body temperature (33.34%) .In Tripati et al study hypotension was present in 37.2% of patients and in Mahopatra et al study shock was present in 13.9% of patients.

MODE OF INJURY

Mode of injury	Present study	Davis et al	Khanna et al
Road traffic accident	90%	70%	57%
Accidental fall	7%	6%	15%

The commonest mode of injury causing injuries in our study is the Blunt abdominal trauma as compared to penetrating abdominal trauma (77.08% Vs 22.92%).The major cause of both blunt and penetrating trauma (>90%) is Road traffic accident (RTA) followed by accidental fall. This is due to the rapid development in technology, in all fields including automobile industry where the first priority has been given to speed rather than safety.

In 24.12% of cases a definitive pre operative diagnosis was possible and in another 34.94% of cases there was only a high index of suspicion.

ORGAN INJURIES

Organ injured	Present study	Cusheri	Davis et all	Cox et all	Khanna et all
Small bowel	49.99%	9%	8%	8%	57%
Small bowel with mesentery	29.16%	5%	4%	10%	47%
Stomach	12.50%	1%	1%	7%	
Colon	8.32%				

The most common site of hollow viscus perforation in our study was ileum (35.41%) followed by combined injury of ileum and mesentery (18.75%) as compared to several studies which also small intestine to be the most common site. The descending colon was the least site to be affected (4.16%) .

Isolated perforation is the most common type of injury encountered in our study (64.58%) and hence a simple debridement of the wound edges followed by primary wound closure of the wound was done in 77.08% of cases. This is in accordance with concept of damage control surgery thereby considerably reducing the duration of the surgery comparing to resection and anastomosis of bowel and has shown an increase in the survival rate and decreased incidence of leak in these patients.

ASSOCIATED INJURIES

	Present study	**Davis et al**	**Khanna et al**
Orthopaedic	30.30%	15%	27%
Neurosurgical	24.24%	9%	12%
Thoracic	12.12%	27%	24%

The most common associated injuries in our study are the Orthopaedic injuries (30.30%) followed by neurosurgical injuries (24.24%) as compared to western literatures where it is said that thoracic injuries are the most common of the associated injuries.

In our study the overall complication rate is 41.66%. Respiratory infection (16.67%)is the most common complication followed by wound infection(12.5%) and the leak rate was the least complication in our study (2.08%).Our study is comparable to a study by Jolly et al which showed wound infection in 14% of cases. Another study by Davis et al showed wound infection as a complication in 15% of the cases.

The commonest morbidity was the prolonged stay in hospital (>14 days) which accounted for 20.83% followed by incisional hernias (10.41%). Long term morbidity could not be exactly studied in our study. But the effects of morbidity on the life style of patients and long term prognosis needs further follow up.

MORTALITY

Mortality	Present study	Khanna et al	Davis et al	Di Vincenti et al	Cox et al
	27.08%	14%	13.3%	23%	10%

The overall mortality rate was 27.08%. Of this, 70% of deaths occured in poly trauma cases. Mortality is less in patients who were referred early to our hospital i.e.within two days as compared to those patients referred late (21.05% Vs 50%). This was proved statistically significant with a p value of<0.05. It was also shown that mortality is less in patients who were taken up for surgery early i.e. within five hours of admission triage ward (8.33% Vs 18.75%) which was also proved statistically significant with a p value of <0.001.

MORTALITY IN RELATION TO VENTILATORY SUPPORT

Ventilatory support	No of patients	Mortality	Percentage
< 2 days	13	2	4.16%
>2days	6	3	6.25%

In our study it is found that mortality is high in patients who are on prolonged ventilatory support for more than two days (50%), as compared to those patients who were on ventilatory support or weaned from ventilatory support within two days(15.38%). This is due to the development of septicaemia as evidenced by persistent hypotension, tachycardia, tachypnea and hyperthermia leading to ARDS, SIRS(Systemic Inflammatory Response Syndrome) , MODS(Multi Organ Dysfunction Syndrome) and eventually death.

CONCLUSION

From the study conducted on traumatic hollow viscus injuries in Mahatma Gandhi Memorial Government Hospital(M.G.M.H) Trichy, a tertiary trauma care centre we have come to the following conclusions.

Traumatic hollow viscus injuries are quiet common when compared to solid organ injuries. The most commonly affected group are the economically productive age group people .There is a definite male preponderance in our study.

The most common etiology for the hollow viscus injuries in our setup is the Road traffic accident (RTA).

Since pre operative diagnosis is infrequently done in our study hollow viscus injuries are generally recognised late and hence have a poor prognosis compared to solid organ injuries. Most of the hollow viscus injuries are recognized mainly during exploratory laparotomy only. Small intestine particularly the ileum is the most common hollow viscus to be affected. Since isolated ileal perforation is the most common encountered lesion simple debridment of wound edges followed primary closure of the wound carries a good prognosis in both recovery as well as mortality. Mortality was more or less equal to other studies. The commonest cause of death is associated polytrauma, followed by septicaemia owing to delayed referral to our hospital due to the subtle

clinical signs seen in these patients or due to misdiagnosis , severe unstable haemodynamic status at the time of presentation leading to delay in surgery for correcting the heamodynamic status ,respiratory infections in ventilator support patients ,SIRS(Systemic Inflammatory Response Syndrome) leading to MODS(Multi Organ Dysfunction Syndrome) and eventually death.

To reduce the mortality, the recent concept of damage control surgery has to to be stressed strongly whose feasibility and the effectiveness in our setup has to be studied further.

So, we conclude that with early diagnosis, timely reference ,early surgical intervention and intensive post operative care we can definitely save the life of these trauma patients with these relatively rare injuries. Adequate knowledge regarding suspecting intra abdominal injuries and timely reference to a tertiary trauma care centre can definitely bring a marked difference in the prognosis of these patients.

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PATIENT CONSENT FORM

STUDY TITLE : "**PROSPECTIVE STUDY ON TRAUMATIC HOLLOW VISCUS INJURIES".**

STUDY CENTRE : Department of General surgery, K.A.P.Vishwanatham Medical College & M.G.M.H, Trichy.

NAME OF THE PATIENT:

AGE:

SEX:

I.P. No :

I hereby assure that I have fully understood the objective of the above study and purpose of surgical procedure for the above study. I also had the full opportunity to clear my doubts and all my doubts were cleared with full satisfaction. The complications that can occur during surgery and post operative period was also explained to me. I also understood that my participation in this study is voluntary and I am given the freedom to withdraw from this study at any point of time without any reason .I also understand that the ethics committee, regulatory authorities and investigator would'nt need my permission to look into my health records not only with respect to the current study but also for any

research study conducted in future in relation to it, even if I withdraw from the study. I understand that unless required under the law my identity will not be revealed in any information released to third parties or published. I also agree not to restrict the use of any data or results that arise from the study.

I hereby give the consent for participating in this study and for various surgical procedures and their final outcomes.

Time:

Date:

Place:

Signature/thumb impression of the

Participant/attender : ……..

Name of the participant : ……..

Signature of the investigator: _____

Name of the investigator: _____

கய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு

விபத்தினால் குடலில் ஏற்பட்ட காயங்கள் மற்றும் அதன் விளைவுகள் பற்றிய ஆய்வு

ஆராய்ச்சி நிலையம் :

பங்கு பெறும் நோயாளியின் பெயர் : வயது :

பாலினம் : ஆண் ☐ பெண் ☐

பங்கு பெறும் நோயாளியின் எண் :

நோயாளியின் பெயர்/ விலாசம் :

நோயாளி இதனை ( ) குறிக்கவும் :

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

என்னை இவ்வாய்வில் தன்னிச்சையாகதான் பங்கேற்க வைக்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் என்னை இவ்வாய்வில் இருந்து விலக்கி கொள்ளலாம் என்றும் அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் விலக்கிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதை பரிசோதிக்க என் முழு மனதுடன் சம்மதிக்கின்றேன். ☐

இந்த ஆய்வின் என்னை உடுபத்த முழுமனதுடன் ஒப்புக் கொள்கிறேன். இந்த அறுவைச் சிகிச்சை மற்றும் அதனால் ஏற்படக் கூடிய பின் விளைவுகள் மற்றும் எதிர்பாராத விளைவுகள் பற்றி எனக்கு விளக்கமாக தெரிவிக்கப்பட்டது. ☐

என் நலன் கருதியே இந்த ஆய்வு மேற்கொள்ளப்பட்டது என்று தெரிந்து இந்த ஆய்விற்கு ஒப்புதலிக்கின்றேன். ☐

நோயாளியின் கையொப்பம்.....இடம்.....தேதி .....

கட்டைவிரல்ரேகை(இந்த படிவம் படித்து காட்டப்பட்டு புரிந்து கைரேகை அளிக்கின்றேன்)

ஆய்வாளரின் கையொப்பம்.....இடம்.....தேதி.....

ஆய்வாளரின் பெயர்.....

PROFORMA

PROFORMA DATA SHEET

NAME:

AGE:

SEX:

IP No:

ADDRESS:

HISTORY

MODE OF INJURY

- Blunt trauma
- Penetrating trauma

REFERAL TIME

- < 2 days
- >2days

GCS OF THE PATIENT

GENERAL EXAMINATION

VITALS

- Pulse
- Blood pressure
- Respiratory rate
- Temperature

PHYSICAL EXAMINATION

INVESTIGATIONS

- Routine blood investigations
- Complete Blood Count
- Renal function tests
- Blood grouping and typing.

X Ray Chest

X ray abdomen erect

Paracentesis

Ultrasound abdomen and pelvis

CT abdomen and pelvis

TIMING OF SURGERY

< 5 hours

>5 hours

SITE OF INJURY:

TYPE OF INJURY:

ASSOCIATED INJURIES:

TYPE OF SURGERY UNDERGONE:

VENTILATORY SUPPORT

- <2 days
- >2 days

COMPLICATIONS:

OUTCOME:

RE ADMISSIONS:

MORTALITY:

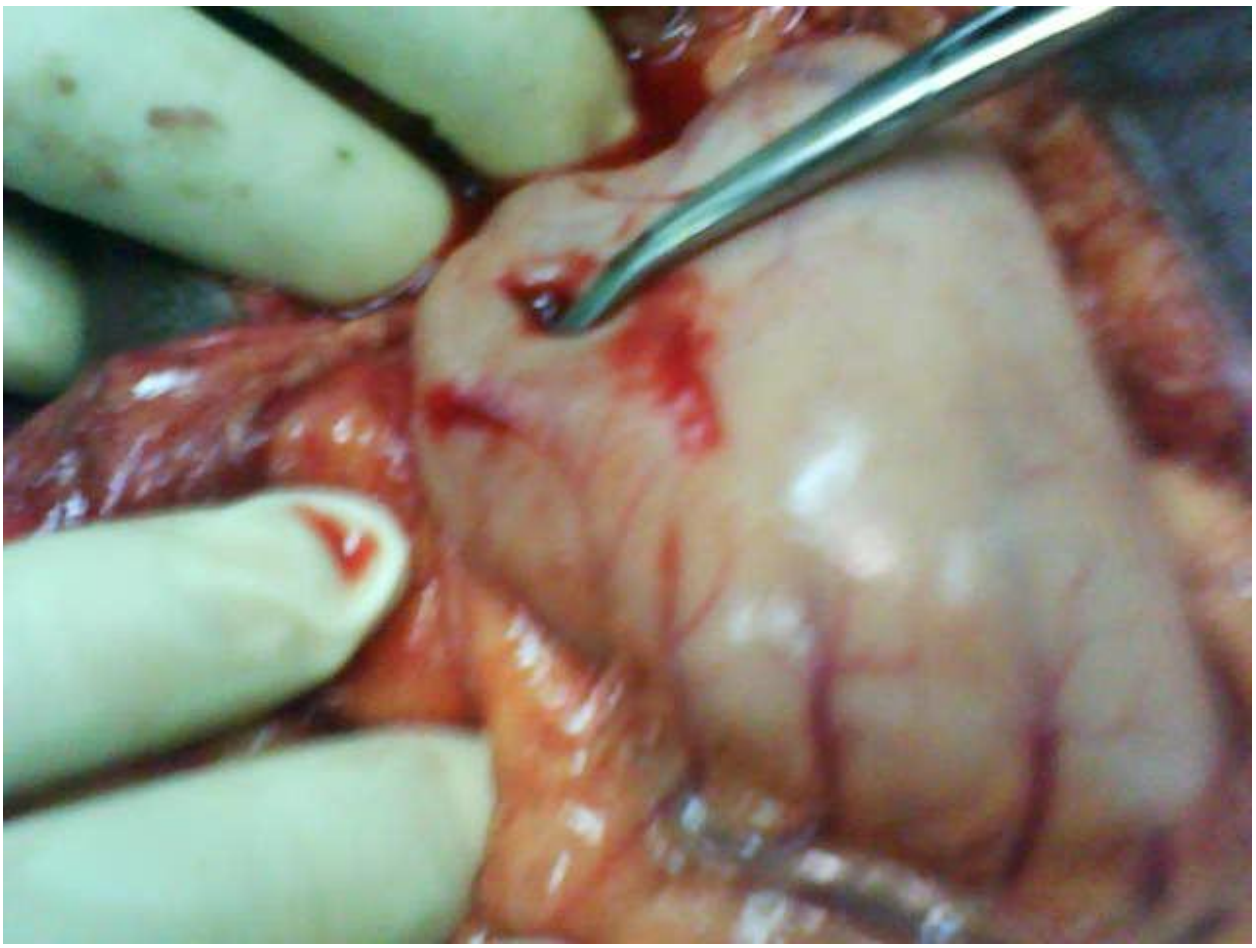
ABBREVIATIONS

2D	-	2 days
5H	-	5 hours
A	-	abscess
B	-	blunt trauma
BA	-	burst abdomen
C	-	chest
CL	-	collection
CO L	-	colon
CT	-	complete tear
D	–	definite
DUO	–	duodenum
F	–	female
IH	–	incisional hernia
IL	–	ileum
JE	–	jejunum
L	–	leak
M	–	male
ME	–	mesentery
MI	–	mesentery and small intestine
N	–	neuro
O	–	ortho

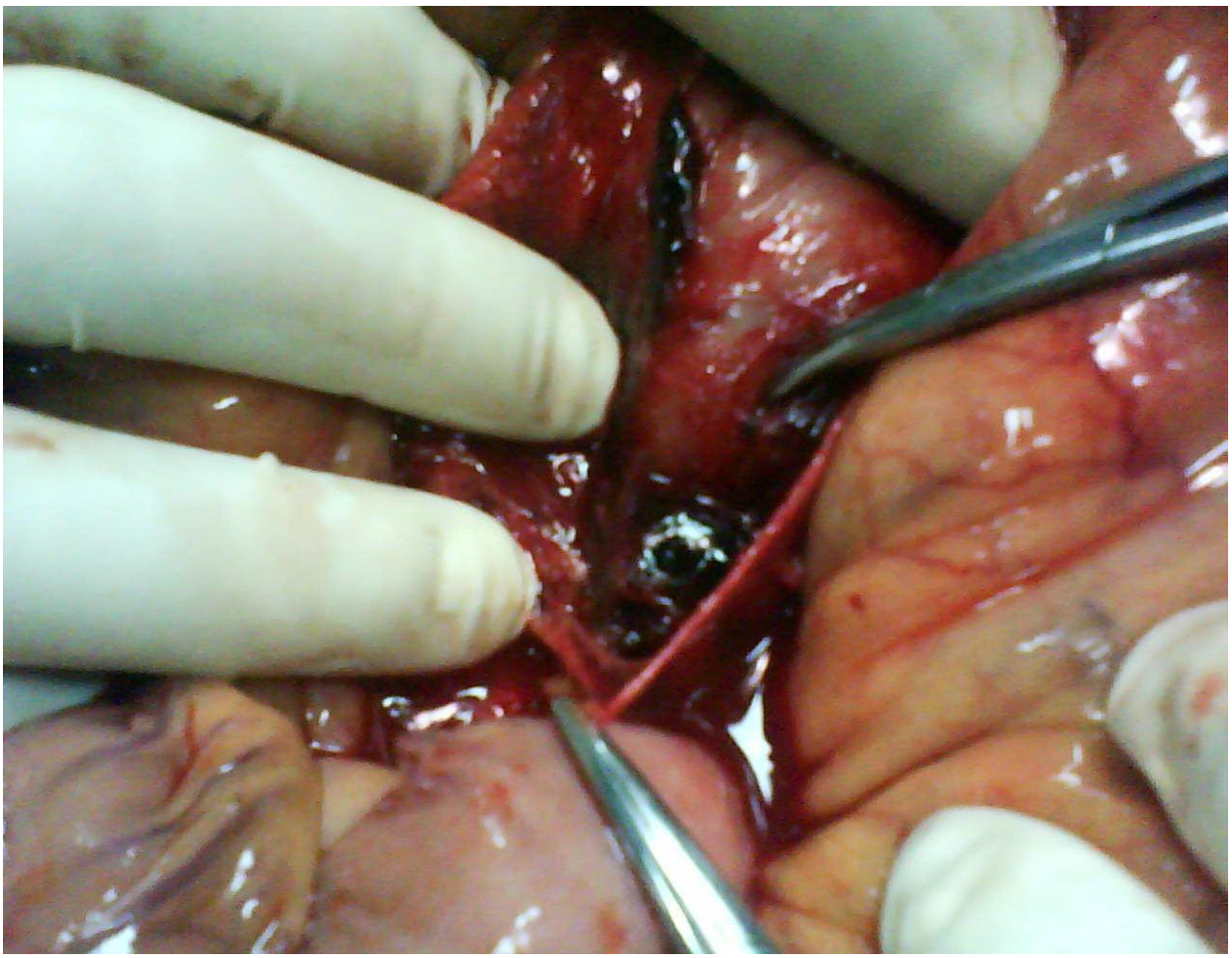
OS	–	ostomy site complication
OST	–	ostomies
P	–	penetrating trauma
PRIM CLOS	–	primary closure
PE	–	perforation
PH	–	prolonged hospital stay
PL	–	plastic
PT	–	partial transection/tear
RTI	–	respiratory infection
RES+ANAS	–	resection and anastomosis
RE	–	rectum
RSURG	–	re surgeries
S	–	suspicious
SIG	–	sigmoid
SO	–	solid organ
STOM	–	stomach
URO	–	urology
UTI	–	urinary tract infection
V	–	vascular
WND INF	–	wound infection.

PENETRATING INJURY ABDOMEN

GASTRIC INJURY INVOLVING THE ANTERIOR SURFACE

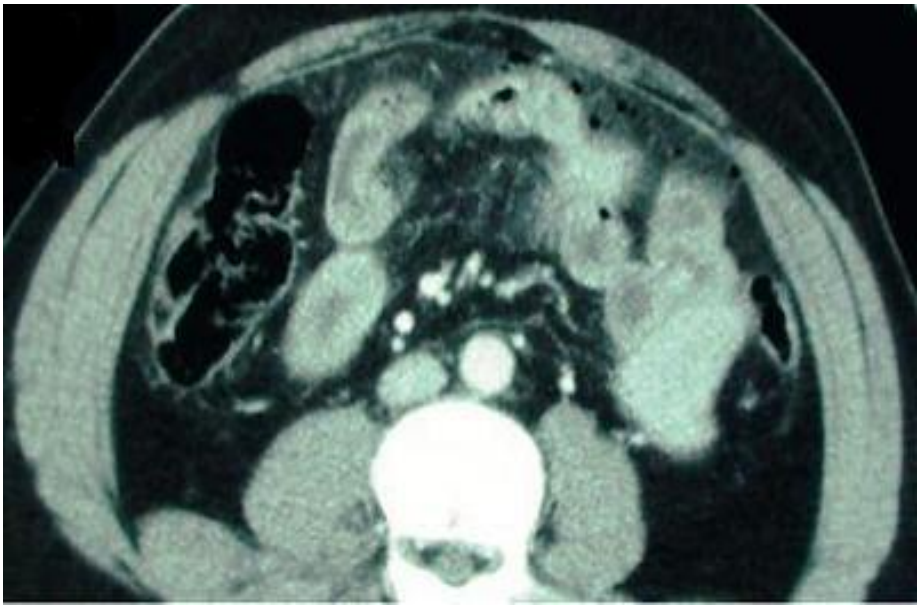


GASTRIC INJURY INVOLVING POSTERIOR SURFACE



CT SCAN SHOWING GASTRIC INJURY

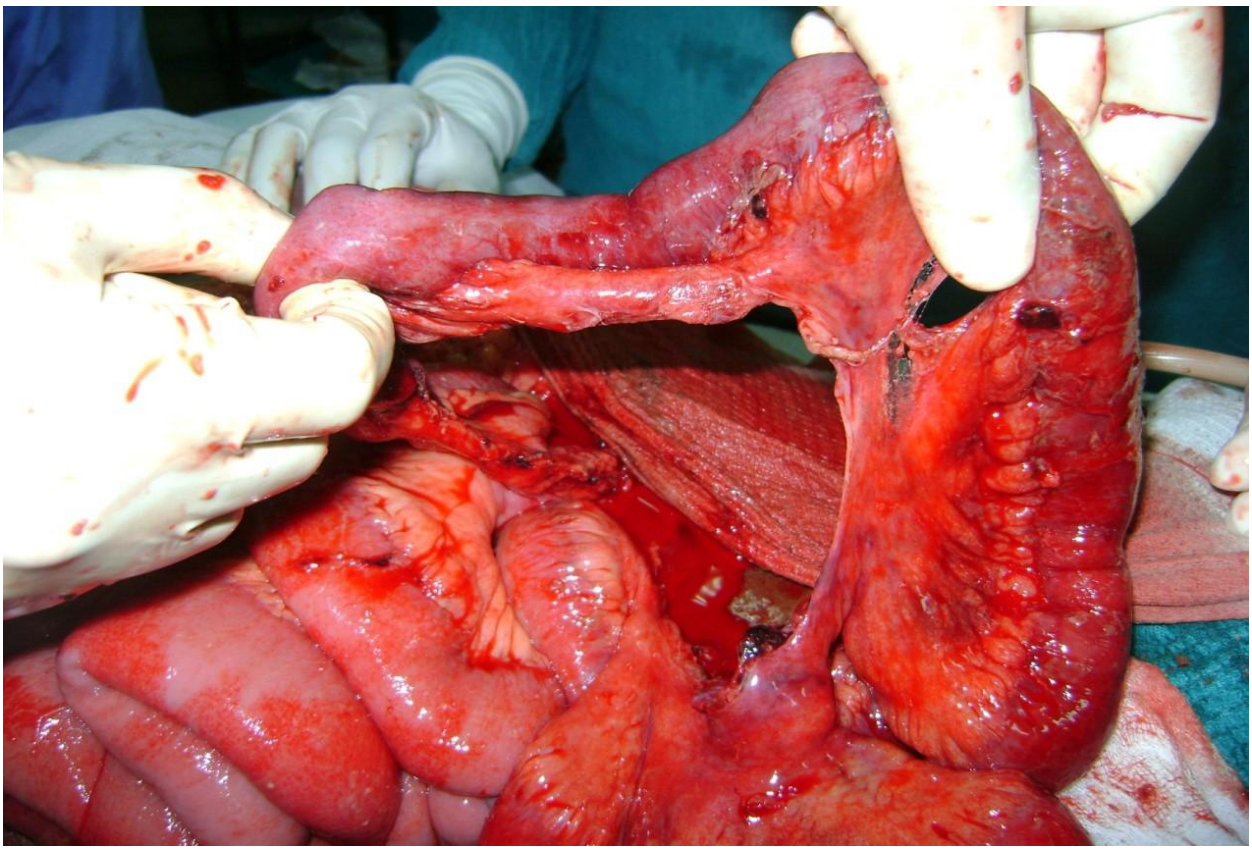
CT SCAN SHOWING SMALL INTESTINE INJURY



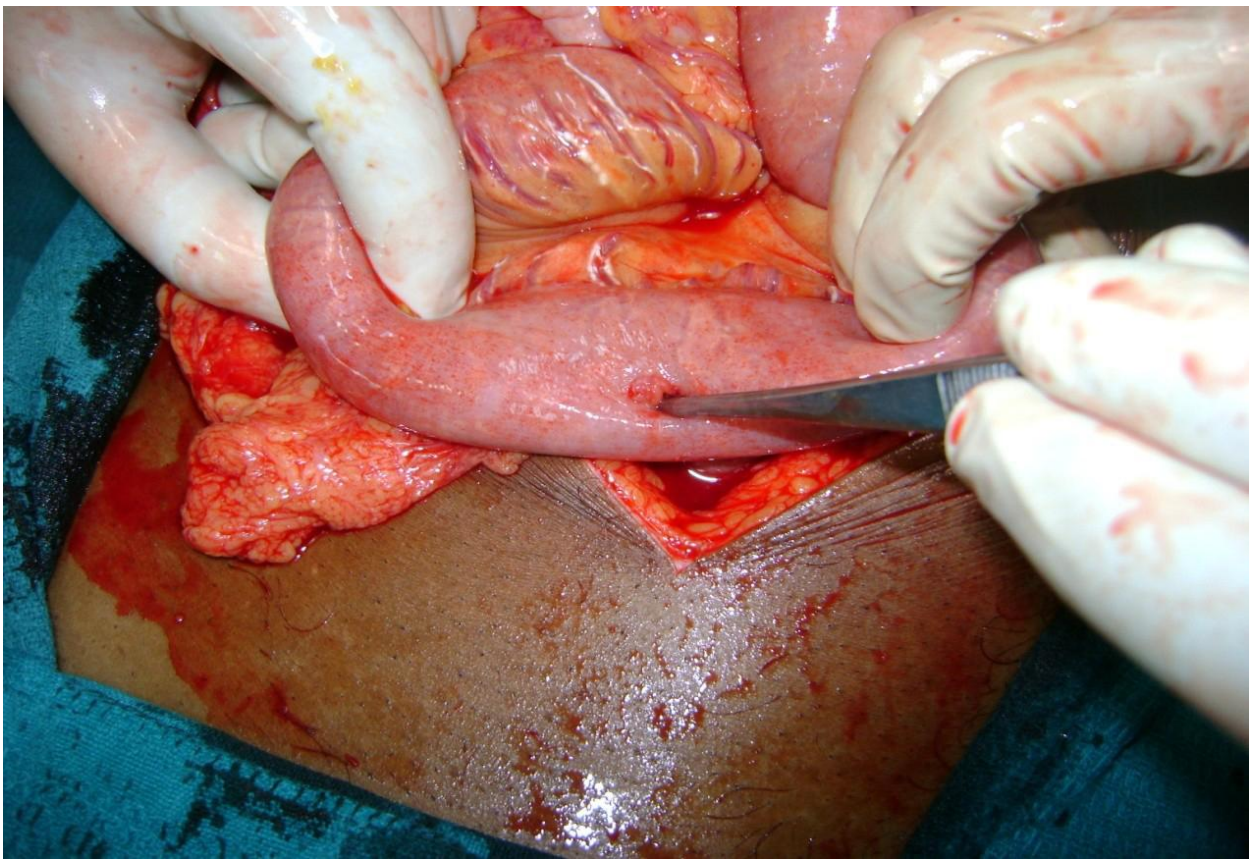
MESENTERIC INJURY NEAR BOWEL

PARTIAL MESENTERIC TEAR

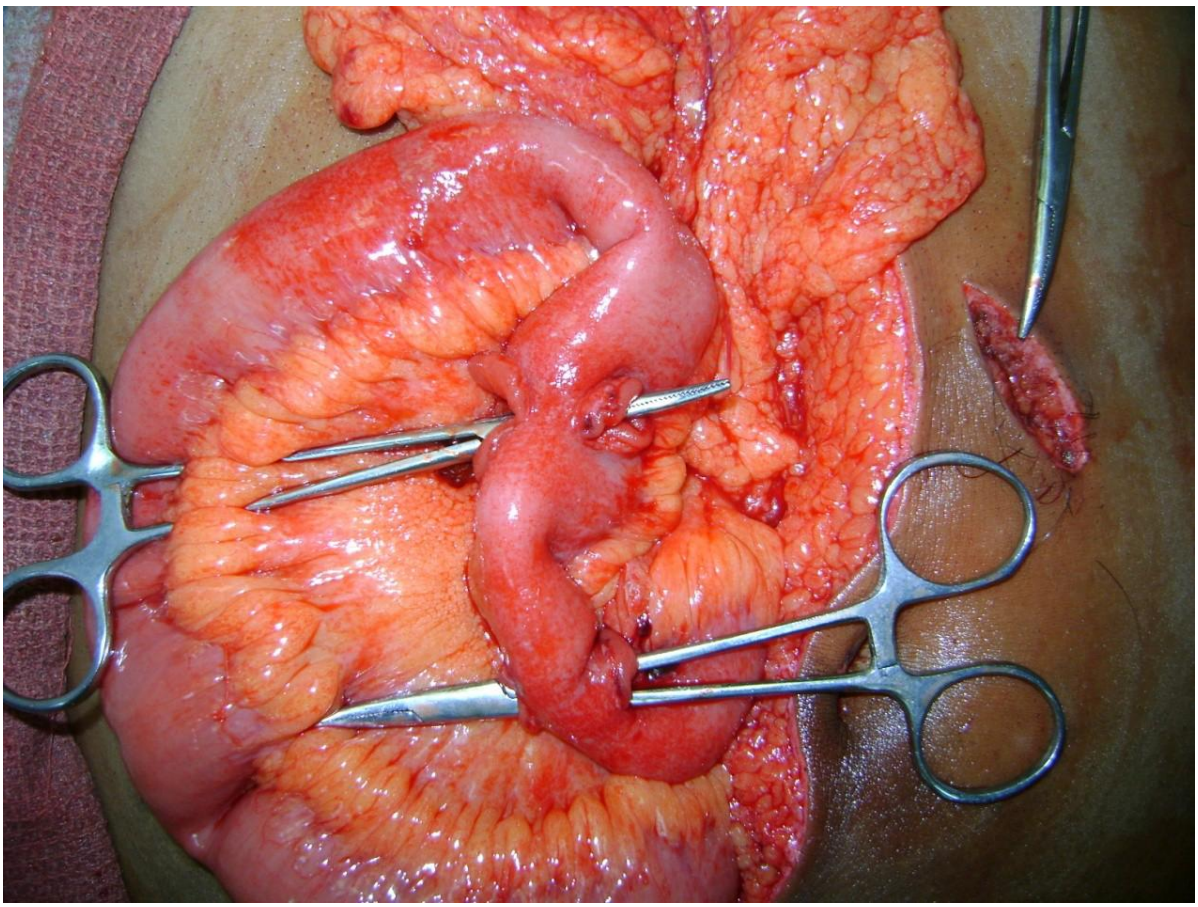
COMPLETE MESETERIC TEAR



ISOLATED JEJUNAL PERFORATION

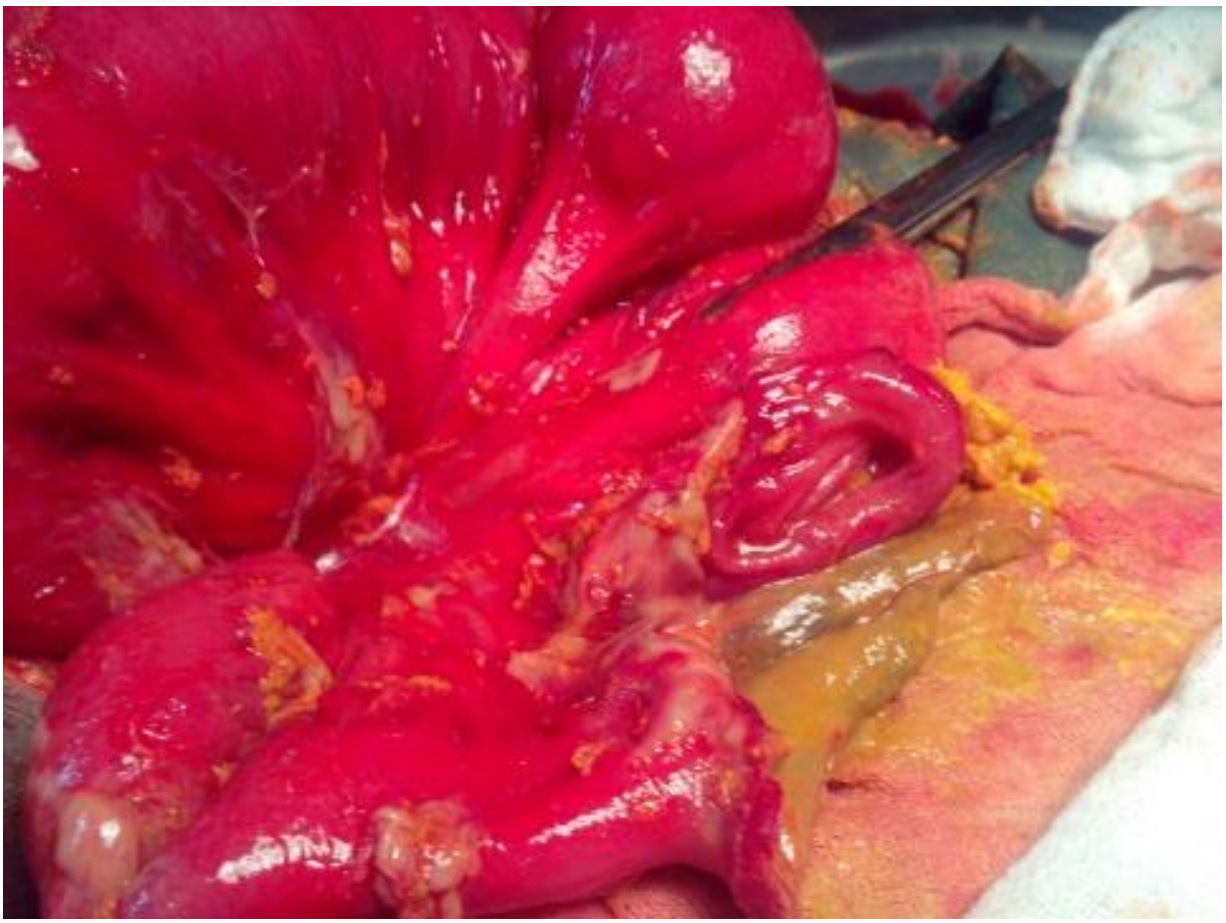


MULTIPLE JEJUNAL PERFORATIONS

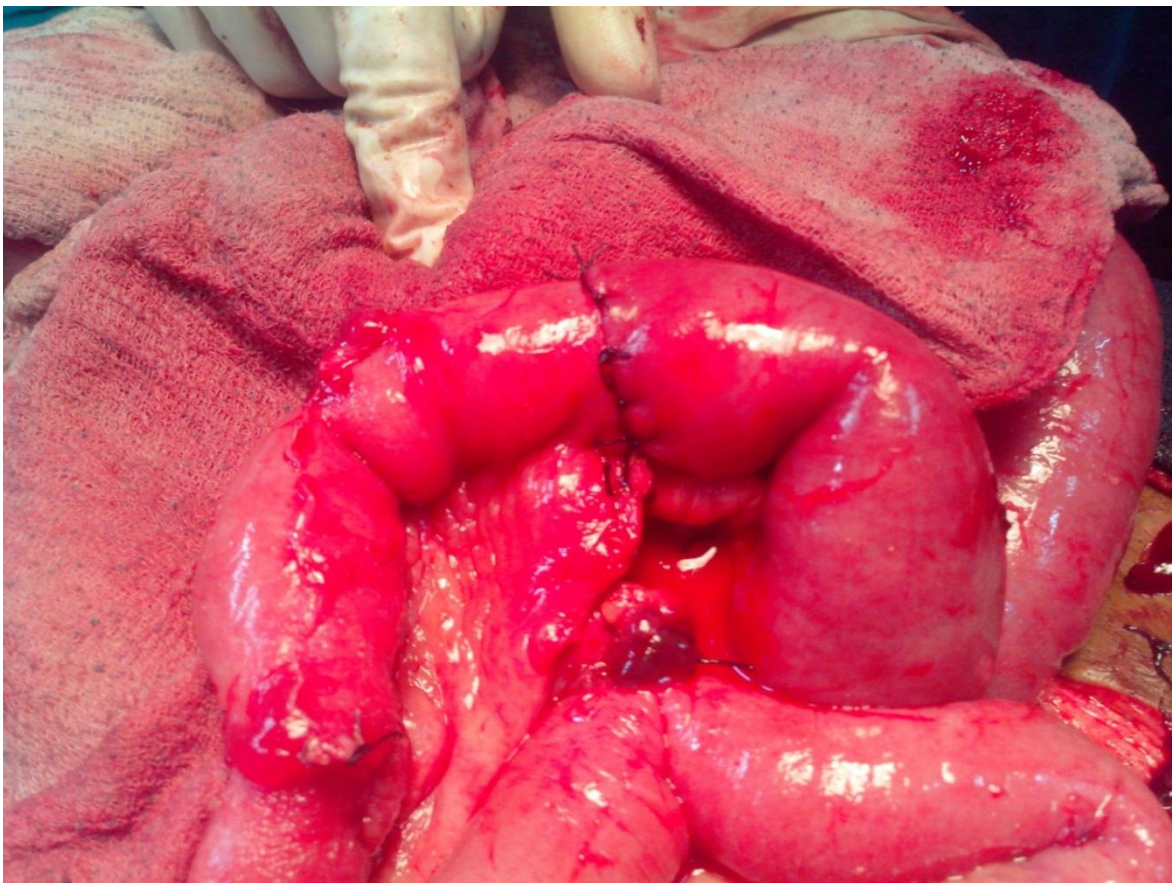


ISOLATED ILEAL PERFORATION

COMPLETE TRANSECTION OF ILEUM.



RESECTION AND ANASTOMOSIS COMPLETED.



S.NO	NAME	AGE/SEX	IP NO	INJURY	REF.TIME	INJ.SITE	INJURY TYPE	TIME OF SUR	SUR PRO	ASSOCIATED INJURIE	BP<90 mmhg	T>100 F	RR>20/min	PR>100	VENT.SUP	COMPLI	MORBIDTY	MORTALIT
1	PERIYASAMY	65/M	22328	BLUNT	<2 DAYS	ILEUM	SINGLE PER	>5 HRS	PRIM.CLOSURE	SPLEEN,HEAD	YES	YES	YES	YES	<2 DAYS	RES. INF		DEATH
2	ROOPARANI	30/F	44708	BLUNT	<2 DAYS	JEJUNUM	SINGLE PER	<5HRS	PRIM.CLOSURE									
3	RAMASAMY	60/M	58942	BLUNT	>2 DAYS	ILEUM	SINGLE PER	<5HRS	PRIM.CLOSURE	UROLOGY	YES		YES	YES				DEATH
4	PONNUSAMY	40/M	17078	BLUNT	<2 DAYS	ILEUM	SINGLE PER	<5HRS	PRIM.CLOSURE									
5	ALAGARSAMY	33/M	28774	BLUNT	<2 DAYS	JEJ+MESE	SINGLE+MES	>5HRS	RESECT+ANAS	SPLEEN,HEAD,LIVER,C	YES	YES	YES	YES	>2 DAYS	RES. INF	RESURGERY	DEATH
6	JEYARAJ	31/M	56430	PENETRATING	<2 DAYS	STOMACH	SINGLE PER	<5HRS	PRIM.CLOSURE									
7	RANGARAJAN	45/M	37680	BLUNT	<2 DAYS	JEJUNUM	SINGLE PER	<5HRS	PRIM.CLOSURE	PLASTIC	YES			YES			>14 DAYS STAY	
8	RAMASAMY	60/M	40836	BLUNT	<2 DAYS	JEJUNUM	SINGLE PER	<5HRS	PRIM.CLOSURE	ORTHO	YES		YES	YES	<2 DAYS		>14 DAYS STAY	
9	MURUGAN	48/M	1160	BLUNT	<2 DAYS	ILEUM	SINGLE PER	<5HRS	PRIM.CLOSURE									
10	SEKAR	40/M	10290	BLUNT	>2 DAYS	ILE+MES	SINGLE+MES	<5HRS	PRI CLO+MES REP		YES	YES	YES	YES		ABCESS		DEATH
11	ABUDAGIR	40/M	2174	BLUNT	<2 DAYS	ILE+MES	SINGLE+MES	>5HRS	PRI CLO+MES REP	CHEST	YES		YES	YES	< 2 DAYS	RES. INF	>14 DAYS STAY	
12	ABDUL RAHMAN	22/M	11759	PENETRATING	<2 DAYS	JEJUNUM	SINGLE PER	<5HRS	PRIM.CLOSURE									
13	SUNDARAM	48/M	11319	PENETRATING	<2 DAYS	JEJUNUM	SINGLE PER	<5HRS	PRIM.CLOSURE		YES		YES	YES	<2 DAYS			
14	MOORTHY	35/M	40802	BLUNT	>2 DAYS	JEJUNUM	SINGLE PER	<5HRS	PRIM.CLOSURE									
15	GOVINDARAJ	30/M	38175	BLUNT	<2 DAYS	ILE+MES	SINGLE+MES	<5HRS	PRI CLO+MES REP	ORTHO,HEAD	YES	YES	YES	YES	>2 DAYS	WND INF,INCIS HER	>14 DAYS STAY	
16	SELVAM	30/M	42839	BLUNT	<2 DAYS	JEJUNUM	MULTIPLE	<5HRS	RESECT+ANAS									
17	MUTHUKUMAR	16/M	46452	BLUNT	>2 DAYS	JEJUNUM	SINGLE PER	<5 HRS	PRIM.CLOSURE			YES		YES			>14 DAYS STAY	
18	SELVARAJ	28/M	47529	BLUNT	<2 DAYS	ILEUM	MULTIPLE	>5 HRS	RESECT+ANAS	SPLEEN,ORTHO	YES	YES	YES	YES	>2 DAYS	RES. INF		DEATH
19	CHIDAMBARAM	64/M	47601	BLUNT	<2 DAYS	ILE+MES	MULTIPLE	>5 HRS	RESECT+ANAS									DEATH
20	GANESHMOORTHY	38/M	51317	PENETRATING	<2 DAYS	ILEUM	SINGLE PER	<5HRS	PRIM.CLOSURE									
21	ARUNKRISHNAN	16/M	56729	BLUNT	<2 DAYS	ILEUM	SINGLE PER	>5HRS	PRIM.CLOSURE	PLASTIC	YES	YES	YES	YES	<2 DAYS	WND INF,INCIS HER	>14 DAYS STAY	
22	THALAPATHY	29/M	138	PENETRATING	<2 DAYS	STOMACH	SINGLE PER	>5 HRS	PRIM.CLOSURE	LIVER,ORTHO	YES		YES	YES	<2 DAYS			DEATH
23	BASKAR	30/M	8294	PENETRATING	<2 DAYS	ASC.COLON	SINGLE PER	<5 HRS	PRIM.CLOSURE									
24	KARUPAIYA	58/M	22904	BLUNT	<2 DAYS	ILEUM	SINGLE PER	<5 HRS	PRIM.CLOSURE									
25	KANNAN	19/M	23496	BLUNT	>2 DAYS	ILEUM	MULTIPLE	>5HRS	RESECT+ANAS	SPLEEN,ORTHO,HEAD	YES		YES	YES	>2 DAYS			DEATH
26	NEELAPATHY	33/M	44110	BLUNT	>2 DAYS	STOMACH	SINGLE PER	<5HRS	PRIM.CLOSURE									
27	PALANISAMY	48/M	51098	BLUNT	<2 DAYS	ILE+MES	MULTIPLE	>5HRS	RESECT+ANAS	CHEST,UROLOGY	YES	YES	YES	YES	<2 DAYS	RES&WND.INF,INCIS HER		
28	VADIVEL	50/M	32812	BLUNT	<2 DAYS	ILE+MES	SINGLE+MES	<5HRS	PRI CLO+MES REP									
29	PERIYASAMY	25/M	52880	BLUNT	>2 DAYS	STOMACH	SINGLE PER	>5HRS	PRIM.CLOSURE	HEAD	YES			YES	>2 DAYS		>14 DAYS STAY	
30	KAMATCHI	65/F	48303	BLUNT	<2 DAYS	ILEUM	SINGLE PER	<5 HRS	PRIM.CLOSURE									
31	RANGASAMY	40/M	54438	BLUNT	<2 DAYS	ASC.COLON	SINGLE PER	<5HRS	PRIM.CLO+COLOSTOMY		YES	YES	YES	YES	<2 DAYS	OSTOMY COMPLIC/	>14 DAY STAY,RESUR	
32	MANIVEL	37/M	58547	PENETRATING	<2 DAYS	ILEUM	SINGLE PER	<5HRS	PRIM.CLOSURE									
33	RAMESH	30/M	4034	PENETRATING	<2 DAYS	STOMACH	SINGLE PER	>5HRS	PRIM.CLOSURE	LIVER	YES	YES	YES	YES	>2 DAYS	UTI	>14 DAYS STAY	
34	MANIVEL	25/M	30475	BLUNT	<2 DAYS	ILE+MES	MULTIPLE	`<5HRS	RESECT+ANAS									
35	NATARAJ	55/M	30125	BLUNT	<2 DAYS	JEJ+MESE	SINGLE+MES	>5HRS	RESECT+ANAS	ORTHO,HEAD	YES	YES	YES	YES	<2 DAYS	WND INF,INCIS HER	>14 DAYS STAY	
36	RAJAMANICKAM	60/M	50817	BLUNT	<2 DAYS	JEJUNUM	MULTIPLE	<5HRS	RESECT+ANAS									
37	BALAKRISHNAN	27/M	50820	BLUNT	<2 DAYS	ILEUM	SINGLE PER	>5HRS	PRIM.CLOSURE	ORTHO,CHEST,HEAD		YES	YES	YES	<2 DAYS	RES. INF		DEATH
38	VADIVEL	50/M	32812	PENETRATING	<2DAYS	DES.COLON	SINGLE PER	<5 HRS	PRIM.CLOSURE									
39	MALAR	45/F	30616	PENETRATING	>2 DAYS	COLON	SINGLE PER	<5 HRS	PRIM.CLOSURE		YES	YES	YES	YES	<2 DAYS	WND INF,INCIS HER		
40	AROCKIAM	47/F	37394	PENETRATING	<2 DAYS	ILEUM	SINGLE PER	<5 HRS	PRIM.CLOSURE			YES	YES	YES		RES.INF		DEATH
41	AROCKIARAJ	45/M	25232	BLUNT	<2 DAYS	ILEUM	MULTIPLE	>5HRS	RESECT+ANAS	ORTHO	YES			YES			>14 DAYS STAY	
42	SAPPANI	50/M	60632	BLUNT	<2 DAYS	ILEUM	MULTIPLE	<5HRS	RESECT+ANAS									
43	PALANIAMMAL	38/F	59720	BLUNT	<2 DAYS	ILE+MES	SINGLE+MES	<5HRS	PRI CLO+MES REP									
44	MOORTHY	37/M	47812	BLUNT	<2 DAYS	ILEUM	SINGLE PER	<5 HRS	PRIM.CLOSURE		YES	YES	YES	YES	<2 DAYS	RES.INF,WND INF	>14 DAYS STAY	
45	BASHA	48/M	64072	BLUNT	>2 DAYS	ILE+MES	SIN+MES+GAN(	>5HRS	RES+END ILEOSTOMY	UROLOGY,HEAD		YES	YES	YES		ABCESS,LEAK	RESURGERY	DEATH
46	SUJATHA	30/F	19248	BLUNT	<2 DAYS	ILEUM	SINGLE PER	<5HRS	PRIM.CLOSURE		YES		YES	YES	<2 DAYS			
47	MOOKAYIAMMAL	65/F	13792	BLUNT	>2 DAYS	STOMACH	SINGLE PER	>5HRS	PRIM.CLOSURE	ORTHO	YES		YES					DEATH
48	SAMIKANU	62/M	44712	BLUNT	<2 DAYS	ILEUM	SINGLE PER	<5 HRS	PRIM.CLOSURE		YES		YES	YES				DEATH